SOIL SURVEY OF SAN BERNARDINO NATIONAL FOREST AREA, CALIFORNIA

United States Department of Agriculture
Forest Service and Soil Conservation Service
in cooperation with
The Regents of the University of California
(Agricultural Experiment Station)

How To Use This Soil Survey

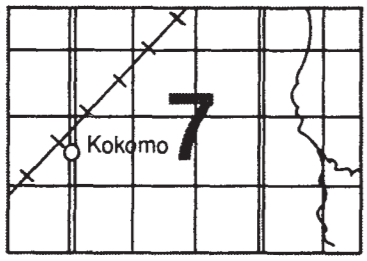
General Soil Map

The general soil map, which is the small scale map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

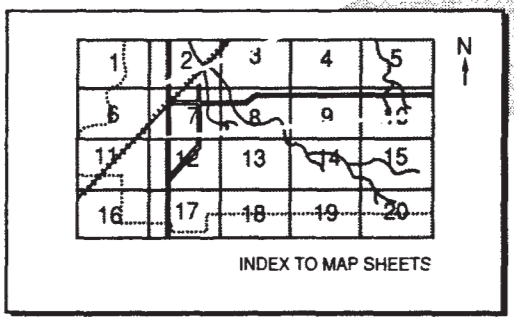
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



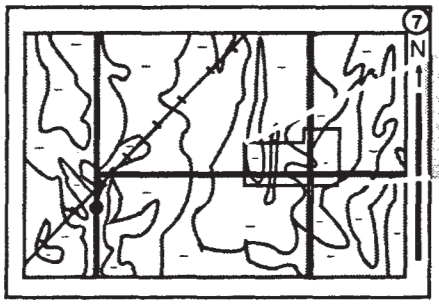
MAP SHEET

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

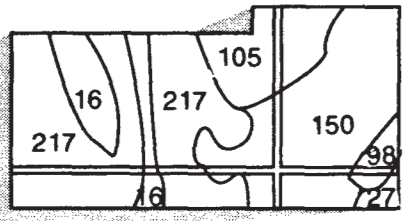


INDEX TO MAP SHEETS

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

San Bernardino National Forest Area, California

This soil survey is a publication of the National Cooperative Soil Survey and a joint effort of the United States Department of Agriculture and the Regents of the University of California (Agricultural Experiment Station). The fieldwork and technical quality control for this survey were done by the Forest Service. The correlation of the soils was done by the Soil Conservation Service in consultation with the Forest Service. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, handicap, or age.

The fieldwork for this soil survey was done in the period 1974-79. Soil names and descriptions were approved in 1981. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979. The soil survey area consists of the San Bernardino National Forest in parts of San Bernardino and Riverside Counties.

Cover: Arrowhead landmark in an area of Lithic Xerorthents, warm-Rock outcrop complex, 50 to 100 percent slopes.

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Foreword

The Soil Survey of the San Bernardino National Forest area, California, in parts of San Bernardino and Riverside Counties, was designed to facilitate broad forestwide resource management planning and to increase the knowledge of our environment. The survey contains predictions of soil behavior for selected land uses. It also points out limitations or hazards to land uses that are inherent in the soil.

This soil survey has been prepared primarily for forest resource planners and managers. It is useful for preliminary project planning, for identifying general soil management considerations, and for evaluation of more intensive soil survey needs. With field verification, the survey could be used for detailed resource management and project-level planning.

Soil properties can vary greatly within short distances. Soils may be shallow to bedrock and have low available water capacity. These conditions inhibit the growth of deep-rooted tree species. Some soils may be seasonally wet and have a high water table or are subject to flooding. Other soils may be prone to landslide activity and are unstable.

These and many other properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each soil map unit is shown on detailed soil maps. Each kind of soil in the survey area is described, and information about specific uses is given for each soil.

This soil survey can be useful in the conservation, improvement, and productive use of soil, water, and other resources.

GENE ZIMMERMAN
Forest Supervisor
San Bernardino National Forest

Soil Survey Index

San Bernardino National Forest Area 1987

Location of the San Bernardino National Forest Area, California

Soil Survey of San Bernardino National Forest Area, California

by Barry R. Cohn and James G. Retelas, Forest Service

Soils surveyed by James G.Retelas, Willie Brock, and Melody S. Fountain, Forest Service; H. Esmaili and Associates, Inc., and Soil and Land Use Technology, Inc.

THE SAN BERNARDINO NATIONAL FOREST survey area is 812,910 acres in size, of which 631,910 are National Forest System lands. The remaining 181,000 are State of California lands or are privately owned. San Bernardino County contains 436,535 acres of the San Bernardino National Forest and Riverside County contains 195,375 acres.

The San Bernardino National Forest is located within four mountain ranges in southern California. Most of the San Bernardino National Forest occupies the San Bernardino Mountains and the eastern part of the San Gabriel Mountains in the southwest corner of San Bernardino County. This area of the forest comprises the Arrowhead, Big Bear, Cajon, and San Gorgonio Ranger Districts. A separate part of the forest covers parts of the San Jacinto Mountains and Santa Rosa Mountains, composing the San Jacinto Ranger District, which is centrally located in the west half of Riverside County.

The northern part of the forest is bordered by the Mojave Desert to the north, a series of less prominent mountains to the east, the Angeles National Forest to the west, and the Santa Ana Valley and San Gorgonio Pass to the south. The southern part, within the San Jacinto and Santa Rosa Mountains, is bounded by the San Gorgonio Pass to the north, the San Jacinto Valley to the west, the Coachella-Imperial Valley to the east, and the Peninsular Mountain range to the south.

General Nature of the Survey Area

This section provides general information about the survey area. It discusses history and development, natural vegetation, physiography, drainage, water supply, and climate.

History and Development

At the time of European contact, the area of the forest was occupied or used by various Native American groups. These included the Gabrielino, the Serrano, the Cahuilla, the Luiseno, and possibly the Kitanemuk. Chemehuevi probably hunted on the northeastern desert slopes, and the Mojaves passed through the area on their trade expeditions from the Colorado River to the Gulf of California and the southern California coast. These groups ranged in defined territories from the flatlands of the valleys to the mountains of the forest. However, as Europeans entered the area in ever-increasing numbers, the native populations were pressured into giving up their territories at the lower elevations and moving either to the missions or up into the mountains. Finally, they were removed even from this sanctuary when gold was discovered in the Holcomb Valley area and later in the Lytle Creek area. Evidence of their prehistoric use of the forest is visible today in the form of campsites, bedrock mortars, petroglyphs, rock shelters, and flake scatters. The first European contact in the immediate area occurred when Spanish explorers - Portola in 1769, Fages in 1772, and Garces in 1776 - traveled in the area of the forest. Initially, these men were looking for mission sites or rounding up deserters or recruiting Indian converts to the Christian way of life. Later, they went into the forest for water and raw materials and to bring back Indian neophytes who had reconsidered their decision to abandon their traditional values and lifestyles. Use of the forest area was sporadic at best.

Gold, grazing, some homesteading, water impoundments, and timber largely determined the patterns of increasing use in the San Bernardino and San Jacinto Mountains from the 1830's on. The natural corridor formed by the Cajon Pass area facilitated a steady influx of goods and services for all of these activities. It is still a major transportation and utilities corridor today.

The San Bernardino National Forest has existed since 1925; moreover, some form of governmental organization over the San Bernardino, San Gabriel, and San Jacinto Mountains has existed since the early 1890's. From the 1890's to about 1910, government's role was limited to conducting land, water, and mineral surveys and recording various individuals' claims to the land-possessory

claims, homesteads, mining claims, and deeds. All land not already under private control was in the hands of the U.S. General Land Office until 1893. Therefore, all legitimate claims for timber, homesteading, or other purposes resulted in the private acquisition of land if the proper terms of the claims were fulfilled. Thus, Garner Valley, the entire western San Bernardino Mountains timber belt, the Idyllwild area, and later Big Bear Lake, Arrowhead Lake, and West Cajon Valley became extensive private reserves. These lands were open to clear-cutting and overgrazing as well as to destructive mining practices such as hydraulic mining.

On February 25, 1893, a congressional bill was signed calling for the establishment of the San Bernardino National Forest Reserve. The area set aside was changed and reduced several times before present-day boundaries were established in the late 1910's or early 1920's. The reserve was created in response to growing public alarm over indiscriminate clear-cutting and overgrazing of the nation's forested lands. Destruction of valuable watersheds and the danger of large wildfires also caused public dismay. In the San Bernardinos, however, the best timbered land had already been cut. Strong early actions were undertaken regarding the grazing of federal lands: intermittent bans were placed on sheep grazing, and there was a temporary exclusion of cattle from Reserve ranges.

Between 1907 and 1925, a series of jurisdictional shifts occurred. By 1909, the San Bernardino National Forest Reserve had been parceled out to the Angeles National Forest and Cleveland National Forest. It ceased to exist as an entity and was managed from these two more distant forests.

With the explosion of recreational use in the San Bernardino Mountains from the 1890's on and a huge increase in use in the 1920's, it became apparent that greater management control was required. In May 1925, the San Bernardino National Forest was created from portions of the Angeles and Cleveland National Forests. Protective measures were implemented to avoid overdevelopment of the forest, including the designation of three areas for noncommercial, primitive use as wild areas (1939). These are all now part of the National Wilderness Preservation System - the San Jacinto, San Gorgonio, and Cucamonga Wildernesses.

Today, the administrative unit circumscribed by the forest consists of 812,910 acres of National Forest System lands located in San Bernardino and Riverside Counties. Of this, 631,910 acres are under the direct jurisdiction of the National Forest.

Natural Vegetation

The vegetation on the San Bernardino National Forest is distributed among zones dominated by chaparral, hardwoods, conifer forests, and pinyon woodlands. The distribution of these vegetation zones is related to present climate patterns and biogeographic history. A display of the zonal distribution of vegetation in the forest is at the end of this section.

The northern part of the forest is influenced by the Great Basin and Mojave Desert. The desert affinity is clear not only in dominant vegetation, such as pinyon pine and Joshua trees, but also in the minor floristic elements of the pinyon woodlands. The Sonoran Desert joins the forest on the southeast and similarly influences plant community composition. The Mediterranean climate which prevails in much of California is the dominant influence over all coastward facing slopes.

The lowest slopes of the forest contain elements of soft chaparral, such as black sage (*Salvia mellifera*), coastal sagebrush (*Artemisia californica*), and brittlebush (*Encelia farinosa*). These plants were once dominant on the valley floor, but quickly intergrade into the sclerophyllous shrubs of the Chaparral Zone inside the forest boundary. They are generally drought-tolerant, deciduous, and subject to frequent, swiftly spreading wildfires.

Plant species in the Chaparral Zone generally are evergreen and are adapted to yearly cycles of very high temperatures accompained by drought. They survive on shallow, poorly developed soils to very deep, well developed soils, extracting moisture when it is available from the underlying fractured bedrock. Chamise (*Adenostoma fasciculatum*) is the most common component of the Chaparral Zone, occurring with manzanita (*Arctostaphylos sp.*), Mountain lilac (*Ceanothus sp.*) and birchleaf mountain mahogany (*Cerocarpus betuloides*). Scrub oak (*Quercus dumosa* and others) is located on north-facing slopes, in fog belts, and in other places, such as mountain passes, where cold, moist winters prevail. Wildfire is common in the Chaparral Zone.

Bigcone Douglas-fir (*Pseudotsuga macrocarpa*) occupies steep canyon walls and drainages bisecting the chaparral slopes. Cold, moist air from higher elevations, draining into the canyons, provides the moister environment for these tree islands in the Chaparral Zone.

A compressed zone of hardwoods dominated by canyon live oak (*Quercus chrysolepis*) or interior live oak (*Quercus wislizenii*) forms the transition from shrubs to coniferous trees on the coastal side of the mountains. Mixed stands of conifers, including incense-cedar (*Calocedrus*

decurrens), white fir (*Abies concolor*), sugar pine (*Pinus Lambertiana*) or yellow pines (*Pinus ponderosa, P. coulteri*), cover much of the mountain slopes between 6,000 and 8,000 feet. The Conifer Zone is a good indicator of the elevation at which most precipitation falls as snow rather than rain. Above 8,000 feet the species composition changes to subalpine species like lodgepole pine (*Pinus murrayana*) and limber pine (*Pinus flexilis*). On the summit of San Gorgonio peak there are a few alpine fell fields, characterized by the presence of herbaceous plants and low, shrubby, slow-growing woody vegetation.

The northern and eastern slopes of the mountain ranges support wooded areas of pinyon pine (*Pinus monophylla* and *P. quadrifolia*) with western juniper (*Juniperus occidentalis*) or California juniper (*Juniperus californicus*). Open spaces, sometimes as a result of wildfire, contain Great Basin sagebrush (*Artemisia tridentata*) or rabbitbrush (*Chrysothamnus nauseosus*).

Riparian vegetation follows stream courses through all forest zones. Species change with elevation, ranging from cottonwoods (*Poplus fremontii*) and sycamore (*Platanus racemosa*) at low elevations in the Chaparral Zone to bigleaf maple (*Acer macrophylla*), alders (*Alnus rhombifolia*) and willows (*Salix sp.*) in the Conifer Zones. Large meadows of sedges and rushes with occasional willows are found in the headwaters of the Santa Ana River and tributaries to the San Jacinto River.

Unusual elements of the forest's vegetation include two small groves of aspen (*Populus tremuloides*), relicts from the Pleistocene period. The Big Bear Basin contains several interesting centers of endemism. Particularly interesting species unique to the area are low-growing cushion plants endemic to soils derived from limestone or dolomite and several species endemic to clay soils (Hodgson Family) that have surface cobbles (or pavement) of Saragossa Quartzite. Mountain meadows, once extensive in the basin but now relegated to a few acres surrounding Big Bear Lake and Baldwin Lake, contain two endemic species (*Sidalcea pedata* and *Thelypodium stenopetalum*) which are now in the process of becoming federally listed as endangered species.

The natural vegetation groupings (zones) and their proportionate extent in the survey area are as follows:

Chaparral	35 percent
Hardwood	23 percent
Conifer	21 percent
Pinyon Pine	20 percent
Riparian	1 percent

Geomorphology

The San Bernardino National Forest is characterized by four principal mountain ranges; the San Gabriel, the San Bernardino, the San Jacinto, and the Santa Rosa. The San Gabriel and San Bernardino ranges make up what is known as the "main divide", that part lying north of San Gorgonio Pass and almost entirely within San Bernardino County. The part south of San Gorgonio Pass is mostly the San Jacinto Range, from which the Santa Rosa Range extends toward the southeast, the entire mass being wholly within Riverside County.

Major faults separate the mountain ranges, except the San Jacinto and Santa Rosa Ranges. The San Andreas Fault Zone separates the San Gabriel Range from the San Bernardino and the San Bernardino from the San Jacinto. The San Jacinto Fault defines the southern boundary of the San Gabriel Range and bisects the San Jacinto Range via Rouse Ridge and Thomas Mountain.

The faults have had a tremendous influence on landform development. Many landslides, falls, and unstable areas originate at the fault zones. Steep rock faces frequently are the exposed sides of faults. Many streams follow fault lines.

There are many natural barriers to the underground flow of water in the mountains. The barriers may force percolating water to the surface to form seeps and springs. When underground water encounters a wide fault-crushed zone, it often turns and passes along within and parallel to the fault zone. Many fault zones carry large volumes of water, which were derived from drainages, for long distances. This is especially true of the San Andreas Fault, which has many seeps, springs, and small natural ponds. The slopes of the mountain ranges facing a fault are precipitous, while the faces opposite a fault are characterized by more moderate slopes.

The San Gabriel and San Bernardino Ranges trend east west; the San Jacinto Mountains are oriented north and south, and the Santa Rosa Mountains trend southeast. Elevations range from 2,200 feet to 10,064 feet in the San Gabriel, from 1,600 feet to 11,502 feet in the San Bernardino, from 1,840 feet to 10,804 feet in the San Jacinto, and from 2,400 feet to 8,716 feet in the Santa Rosa. Nearly half of the forest has slopes greater than 50 percent; one-fifth has slopes between 30 and 50 percent, and the rest - slightly less than one-third - has slopes of less than 30 percent. Mean basin slope for the National Forest System watersheds ranges from 16 percent for Murrieta Creek to 65 percent for Snow Creek.

The percentage of forest acreage by slope groupings is as follows:

0 to 15 percent slopes	18
15 to 30 percent slopes	13
30 to 50 percent slopes	20
Over 50 percent slopes	49

The topography has a pronounced influence on precipitation and rainfall distribution pattern. Crystalline metamorphic and granitic rocks are usually considered to be non-waterbearing and nearly impervious, but, the rocks of these mountains have a considerable capacity for temporary storage of water because of the tremendous amount of fractures. Exceptionally deep and rapid weathering is characteristic of these rocks because of the extensive fractures. The capacity of the rocks to receive and store water is very important in any consideration of water relations. If the soils of the forest provided the only place that water could be temporarily stored, the watershed would soon become saturated because the soils are typically shallow (less than 20 inches deep) and thus have relatively little storage capacity.

Four major river systems drain the forest. The Santa Ana River, including its tributary the San Jacinto River, drains all the San Gabriel Range, the south face of the San Bernardino Range, and the west face of the San Jacinto Range. The Mojave River drains most of the north slope of the San Bernardino Mountains. The north and east slopes of the San Bernardino Mountains are drained by numerous intermittent and ephemeral channels which terminate in the Mojave Desert without ever reaching the ocean. A part of the east slope and south slope of the San Bernardino Mountains, the east slope of the San Jacinto Mountains, and the north slope of the Santa Rosa Mountains are drained by the Whitewater River and its tributaries which in turn flow into the Salton Sea. The southern part of the Santa Rosa Mountains is drained by several tributaries to Temecula Creek, which flows into the Santa Margarita River and eventually the Pacific Ocean near Oceanside in San Diego County.

The stream channels are well incised in deep V-shaped gorges. Some of the larger streams terminate in broad flat washes characterized by expanses of boulders, sand, and gravel, mapped as Riverwash.

Stream flows within the watershed fluctuate significantly. They vary from high-volume, rapidly peaking flows of relatively short duration to very minimal flows. Many of the streams of the watershed are intermittent, drying up for many months and in drought years. During high-runoff periods, streams frequently carry heavy loads of mineral soil, rock, and organic debris. The differences in stream flow are related to the geology, the highly variable amounts of precipitation, and the occurrence of high-intensity rainfall. Streamflow is also indirectly related to the removal of vegetation from the slopes of mountainsides, which occurs primarily by fire.

Groundwater recharge from precipitation is an important process. Most recharge occurs in the upper elevations where precipitation is greatest. Areas that are most favorable to recharge are talus slopes and coarse-textured alluvial channel bottoms. Major underground basins lie south and north of the mountains. The basins consist of adjacent irregularly shaped cells filled with coarse sands, gravels, and boulders deposited by the streams emanating from the mountains. A large amount of the water used in southern California is obtained from wells drilled into these underground basins. Replenishment of the basins occurs through percolation of rainwater falling on the surface area, percolation from the surface streams, and deep percolation into the rock mass.

Water-spreading grounds are used to conserve local water supplies. The process involves diverting water from streams and running it through a series of ditches and shallow basins on the alluvial fans at the mouths of the canyons. Water percolates through these pervious alluvial fans to replenish the underground supply. Water spreading helps to trap and store the winter surface streamflow.

Major water yield varies widely both in time and space. Most precipitation falls and most runoff occurs during the winter. Annual water yield has ranged from a low of 65,000 acre-feet in 1961 to over 1.75 million acre-feet in 1969. Water yields from individual National Forest System watersheds range from median yields of zero to over 28,000 acre-feet per year. Demand for water far exceeds supply. Median annual water yield from the forest is estimated at 250,000 acre-feet, while annual demand in and near the forest is estimated at 900,000 acre-feet. Demand is expected to be over one million acre-feet per year by the year 2000.

The water produced from at least 50 percent of the land within the National Forest is used for domestic and municipal supply. The remainder is used for agriculture and groundwater recharge. Water in Lytle Creek, Santa Ana River, Mill Creek, and San Gorgonio River is also used for hydropower generation. Water quality is adequate for beneficial uses, though there are periods during high flows after major wildfires when water users must turn to alternate supplies.

Climate

The prevailing climate in the area is the Mediterranean type, typified by hot, dry summers and cool, moist winters, although these conditions can vary greatly due to topography. Winds are generally light, except for brief periods of strong winds from the northeast. Precipitation ranges from a low of 2 to 5 inches on the desert side to a high of 40 inches on the mountain crest and occurs during the colder part of the year. Snow occurs above 4,000 feet and is common above 5,000 in most years. Sunshine is abundant throughout the year, occurring about 70 to 80 percent of the time.

The average daily temperatures for the slopes that form the mountain valley interface range from the middle 50's to mid 60's degrees F in the winter and high 70's to low 80's degrees F in the summer. Temperatures of 100 degrees F or higher are fairly common in the period of June through October, and temperatures of 32 degrees F or lower occur in December, January, and February in most years. In the mountain crest area of the forest, the average daily temperatures range from the high 20's to the middle 40's degrees F in the winter and middle 60's to middle 70's degrees F in the summer. Temperatures of 90 degrees F or higher occur commonly in June, July, and August, and temperatures of 32 degrees F or lower can occur in any month of the year. On the desert side the average daily temperatures range from the high 20's to the high 30's degrees F and the low to high 80's degrees F in the summer. Temperatures of 100 degrees F or higher are common in the period of May through October, and temperatures of 32 degrees F or lower are fairly common in the period of November through April in most years.

About 90 percent of the annual precipitation falls in the period of November through April. The average annual precipitation is 10 to 30 inches for the mountain valley interface area of the forest, 25 to 40 inches for the mountain crest, and fewer than 10 inches for the desert side. The remaining 10 percent of annual precipitation is produced by thunderstorms during May through October.

Annual precipitation varies considerably from year to year. For example, at San Bernardino the annual rainfall is less than 6.5 inches in 1 year in 20 and more than 30 inches in 1 year in 20. Rainfall intensities vary throughout the forest; the Arrowhead, Big Bear, Cajon, and San Gorgonio Ranger Districts are subject to predominantly high-intensity storms (more than 5.5 inches within 24 hours), and the San Jacinto Ranger District is subject to predominantly moderate-intensity storms (1.75 to 5.50 inches within 24 hours). Flooding and increased erosion can occur from these storms at any time of year.

Prevailing winds are from the southwest. Strong, hot and dry, northeasterly Santa Ana winds are common in the fall and winter months. High temperatures and extremely low humidities associated with these winds create extreme fire danger conditions. Fires occurring during Santa Ana conditions are extremely difficult to control.

How This Survey Was Made

This Order 3 soil survey (2) has followed the directives and guidelines in the Forest Service Manual and Handbooks. It has also followed the concepts, procedures, and guidelines of the National Cooperative Soil Survey as specified in the Soil Survey Manual (4), the National Soil Handbook (6), and the soil classification system as stated in Soil Taxonomy (5).

Soil scientists begin the inventory by collecting, studying, and correlating all the existing data and information concerning the survey area (National Forest) that are related to soil genesis and morphology. This includes lithological, topographical and elevational, climatic, vegetative, and existing soil survey data both within and adjoining the survey area.

The data and information were assimilated and transferred to a single base map of suitable scale and accuracy, forming the beginning soil map unit delineations or schematic map. With the schematic map and aerial photo field sheets (stereo-pair coverage) in hand, the soil scientist made a reconnaissance study of the survey area. At this time, the delineations on the schematic map were checked for accuracy of content and location. The aerial photos were studied stereoscopically and the photo images were compared to the conditions found on the ground to insure that later recognition by photo interpretation would be credible. Lithologic, geomorphic, soil, and vegetative characteristics were recognized and recorded in the field notes, on the schematic map, and on the aerial photo field sheets.

Using the augmented and corrected schematic map, field notes, and an understanding of how the photo images relate to actual conditions on the ground, the soil scientist delineated map units on the aerial photographs. The map units correspond to segments of the landscape having similar landform, vegetative cover, and soils as determined by a knowledge of ground conditions and by stereoscopic aerial photo interpretation. These aerial photos with the delineated map units and delineation symbols became the exploratory or preliminary soil maps.

With the aerial photos (exploratory soil maps) and a field stereoscope in hand, the soil scientist examined on the ground as many delineations of each map unit as possible, considering the access and time allowed to complete the survey. In this way, each different map unit was examined, studied, and described by aerial photo interpretations and on-the-ground investigation. However, because of the design of the survey, Order 3 in intensity (2), and the time allotted for its completion, not every delineation of each different map unit was visited and examined on the ground. Those delineations with no easy access were rarely visited but were scrutinized by aerial photo interpretation. In this way, possibly one-third to one-half of the delineations on the field sheets and maps would not have been entered and examined by an on-the-ground investigation. This is one of the main aspects of this survey that limit its reliability. It is one reason that the survey is not suitable for project planning without field verification.

As each map unit was visited and examined, individual soils were recognized, studied, described, and classified, and enough data were collected to furnish the information needed to make interpretations and predictions concerning the use and management of each soil. However, the exact location of each soil was not delineated. The map units usually consist of a group of soils or miscellaneous areas that occupy a particular part of the landscape which has been delineated on the aerial photo field sheets. Depending on the location and the extent of the individual soils or miscellaneous areas that are components of the delineated map unit, a map unit is called an association or complex of soil or miscellaneous area components. The soil scientist makes a field and aerial photo examination to estimate the percentage of each soil component in each map unit. These map units do not necessarily consist of similar soils. They consist of geographically associated soils that may be, and usually are, quite different in their characteristics and their suitability for use and management. These are other aspects of the survey that limit its reliability and make it not suitable for project planning without field verification.

This field examination and study, together with the associated correction and refinement of the aerial photo field sheets, produced the Order 3 intensity soil maps called for in this system of survey.

The interpretations and predictions concerning use and management found in this report are based on the soil scientist's knowledge and understanding of the conditions recognized and measured in the time allotted to this inventory. By classifying the soils, the soil scientist can also, with acceptable reliability, bring information concerning use and management of a particular soil from other survey areas where this soil occurs and has been recognized and studied. Because of the time allocated for the completion of this survey, these use and management interpretations and predictions should be considered as first or second approximations, owing to

the relative fewness of the examinations and measurements that have been made. This is still another aspect of the survey that limits its reliability and makes it not suitable for project planning without field verification.

Despite the cautions that have been given in the above paragraphs concerning the use of this survey information for project level planning, the survey is adequate and reliable for its intended and designed purpose: a base for a forestwide system of land management planning.

General Soil Map Units

The general soil map shows map units which consist of many individual soils. Each map unit contains soils with similar landforms, parent rock material,and similar geographic areas. A map unit typically is made up of one or more soils of major extent and several soils or miscellaneous areas of minor extent. Map units are named for the major soils or miscellaneous areas occurring in the unit. The soils in one unit can occur in other units. The soils are classified at the family level, or higher taxonomic level.

The map furnishes a broad perspective of the soils in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. General areas which are capable of timber production or spring-summer range can be indentified on the map. Likewise, general areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of the generalization of map units and the small scale of the map, the location of specific soils are not shown. The map and map unit information is not suitable for Forest or project level land management planning. They give a very general overview of soil conditions and are suitable for State or Regional planning. Each of the 8 map units is described on the pages that follow.

1. **Soboba-Avawatz-Morical, dry families**

Gently sloping to steep, very deep, well drained and somewhat excessively drained soils formed in alluvium weathered from granitic and metamorphic rocks.

These soils are on floodplains and on alluvial fans and terraces. Slope is 2 to 50 percent. Elevation is 1,600 to 6,000 feet. Annual precipitation is 8 to 25 inches. Typical vegetation at the lower elevations is mainly chamise, manzanita, and ceanothus. At the higher elevations it is mainly Coulter Pine and canyon live oak. In drainageways it is mainly riparian vegetation consisting of sycamore and cottonwood.

This unit makes up about 11 percent of the soils of the survey area. It is about 40 percent Soboba soils, 25 percent Avawatz soils, and 15 percent Morical, dry soils. Components of minor extent make up the remaining 20 percent.

Soboba soils are gently sloping to moderately steep, have slopes of 2 to 10 percent, and are on floodplains and in drainageways. These soils are very deep and somewhat excessively drained. Typically they have a very cobbly loamy sand surface layer. The substratum is stratified very cobbly loamy fine sand and sand.

Avawatz soils are gently sloping to moderately steep, have slopes of 2 to 10 percent, and are on floodplains and in drainageways. These soils are very deep and somewhat excessively drained. Typically they have a loamy coarse sand surface layer. The substratum is gravelly loamy coarse sand and loamy coarse sand with strata of gravelly loamy sand and sandy loam.

Morical, dry soils are moderately steep to steep have slopes of 15 to 50 percent and are on fans and terraces. These soils are very deep and well drained. Typically, they have a gravelly loam surface layer. The subsoil is clay loam. The substratum is loam over weakly cemented alluvium which breaks down easily to a sandy clay loam.

Of minor extent in this unit are soils of the Hanford, Wilshire, Oak Glen, dry, Ramona, and Wrightwood families; Typic Xerorthents; Typic Xerorthents, warm; Typic Haploxeralfs; and miscellaneous land areas of Riverwash and Badland.

This unit is suitable for use as transitory range. It is poorly suited for type conversion from brush to perennial grass because of the very low available water capacity, low moisture conditions, hazard of erosion, and cobbles and stones on the surface, which may limit machinery operation. Only a few areas at the higher elevations with more favorable moisture conditions are suited to type conversion to perennial grasses, or to reforestation with ecologically adapted conifer or hardwood plant species.

Limited areas with slopes of less than 8 percent, if protected from flooding, are suitable for developed recreation purposes.

2. **Morical, very deep-Oak Glen families-Typic Xerorthents**

Gently sloping to very steep, very deep, well drained to excessively drained soils formed in alluvium weathered from granitic and metamorphic rock.

This unit is on dissected terraces and older terraces and alluvial fans. Slope is 2 to 50 percent. Elevation is 3,200 to 7,800 feet. Annual precipitation is 20 to 35 inches.

Typical vegetation is mainly ponderosa pine, Jeffrey pine, black oak, incense cedar, white fir, Coulter pine or canyon live oak on the Morical, very deep and Oak Glen soils and chamise, ceanothus, or manzanita on the Typic Xerorthents soils. In the Santa Ana Canyon area the typical vegetation is mainly ceanothus or manzanita on the Oak Glen soils.

This unit makes up about 5 percent of the soils of the survey area. It is about 35 percent Morical, very deep soils, 30 percent Oak Glen soils, and 15 percent Typic Xerorthent soils. Components of minor extent make up the remaining 20 percent.

Morical, very deep soils are gently sloping to steep, have slopes of 2 to 50 percent and are on older fans and terraces. These soils are very deep and well drained. Typically, they have a gravelly loam surface layer, a gravelly sandy clay loam subsoil, and a gravelly sandy loam substratum.

Oak Glen soils are gently sloping to moderately steep, have slopes of 2 to 30 percent and are on alluvial fans. These soils are very deep and well drained. Typically, they have a sandy loam surface layer and a sandy loam subsoil and substratum.

Typic Xerorthent soils are hilly to steep, have slopes of 25 to 50 percent, and are on escarpments of incised dissected terraces and alluvial fans. These soils have loamy sand profiles and are 20 to 70 percent rock fragments.

Of minor extent in this unit are soils of the Hecker, Ruch, Oak Glen, dry, and Cagey families. Cagey soils are in Garner Valley and have a fluctuating high water table.

The soils of this unit are capable of wood production. Included are the most productive timber stands in the forest. Some of the drier areas (north of the Santa Ana River) are suitable only for range.

3. Pacifico-Wapi families-Rock outcrop

Hilly to very steep, shallow, somewhat excessively drained soils formed in material weathered from granitic rocks, and Rock outcrop.

This unit is on hills and mountainsides. Slope is 2 to 75 percent. Elevation is 4,000 to 8,000 feet. Annual precipitation is 20 to 35 inches. The typical vegetation is mainly ponderosa pine, Jeffrey pine, Coulter pine, canyon live oak, or black oak.

This unit makes up about 15 percent of the survey area. It is about 40 percent Pacifico soils, 25 percent Wapi soils, and 15 percent Rock Outcrop. Components of minor extent make up the remaining 20 percent.

Pacifico soils are gently sloping to very steep, have slopes of 15 to 75 percent and are on hills and mountainsides. These soils are shallow and somewhat excessively drained. Typically, they have a loamy coarse sand surface layer; the substratum is loamy sand over highly weathered granitic rock.

Wapi soils are hilly to very steep, have slopes of 15 to 75 percent and are on hills and mountainsides. These soils are shallow and somewhat excessively drained. Typically, they have a loamy sand surface layer. The substratum is gravelly loamy sand over hard, unweathered granitic rock.

Rock outcrop occurs as small isolated rock outcroppings or as large massive exposures.

Of minor extent in this unit are soils of the Preston, Morical, Wind River, and Corbett families and the dry phases of Pacifico and Wapi families.

The soils of this unit are capable of limited wood production. The dry phases are capable only of limited forage production.

4. Morical-Wind River-Preston families

Gently sloping to steep, moderately deep and deep, well drained and somewhat excessively drained soils that formed in material weathered from granitic rocks.

This unit is on hills and mountainsides. Slope is 2 to 50 percent. Elevation is 4,000 to 7,500 feet. Annual precipitation is 20 to 35 inches. Typical vegetation is mainly ponderosa pine, Jeffrey pine, Coulter pine, black oak, or canyon live oak.

This unit makes up about 6 percent of the survey area. It is about 35 percent Morical soils, 25 percent Wind River soils, and 20 percent Preston soils. Components of minor extent make up the remaining 20 percent.

Morical soils are gently sloping to steep, have slopes of 2 to 50 percent and are on hills and mountainsides. These soils are moderately deep and deep and well drained. Typically, they have a loam surface layer. The subsoil is gravelly clay loam over highly weathered granitic rock.

Wind River soils are sloping to steep, have slopes of 5 to 50 percent and are on broad ridges or hills and mountainsides. These soils are moderately deep and deep and well drained. Typically they have a sandy loam surface layer. The subsoil is sandy loam and the

substratum is sandy loam. Below the substratum is highly weathered granitic rock.

Preston soils are gently sloping to steep, have slopes of 2 to 50 percent and are on hills and mountainsides. These soils are moderately deep and deep and somewhat excessively drained. Typically they have a loamy sand surface layer. The subsoil and substratum are loamy sand. Below this is highly weathered granitic rock.

Of minor extent in this unit are soils of the Pacifico, Brader, and Green Bluff families.

The soils of this unit are capable of wood production and range forage. Areas of greater than 35 percent slopes are presently not intensively managed.

5. Olete-Goulding-Merkel families

Hilly to very steep, shallow and moderately deep, well drained soils that formed in material weathered from metamorphic rock.

This unit is on hills and mountainsides. Slope is 15 to 75 percent. Elevation is 4,000 to 9,000 feet. Annual precipitation is 15 to 40 inches. The typical vegetation is mainly pinyon pine, juniper, ponderosa pine or Jeffrey pine.

This unit makes up about 6 percent of the survey area. It is about 40 percent Olete soils, 25 percent Goulding soils, and 15 percent Merkel soils. Components of minor extent make up the remaining 20 percent.

Olete soils are hilly to very steep, have slopes of 15 to 65 percent and are on north to east aspects of hills and mountainsides. These soils are moderately deep and well drained. Typically, they have a very cobbly fine sandy loam surface layer. The subsoil is very cobbly loam over hard, highly fractured gneiss.

Goulding soils are hilly to very steep, have slopes of 15 to 75 percent and are on south to west aspects of hills and mountainsides. These soils are shallow and well drained. Typically they have gravelly sandy loam surface layer. The subsoil is a very gravelly loam over hard, slightly weathered gneiss.

Merkel soils are hilly and steep have slopes of 15 to 50 percent and are on hills and mountainsides. These soils are moderately deep and well drained. Typically, they have a gravelly loam surface layer. The subsoil and substratum are very gravelly loam over hard, fractured metamorphic rock.

Of minor extent in this unit are soils of the Switchback, Kilburn, and Springdale families and Rock outcrop.

The soils of this unit are capable of wood production and range forage. Areas that have slopes of more than 35 percent are not intensively managed.

6. Trigo Family-Lithic Xerorthents, warm-Rock Outcrop

Hilly to extremely steep, shallow, somewhat excessively drained and excessively drained soils that formed in material weathered from granitic and metamorphic rocks, and Rock outcrop.

This unit is on hills and mountainsides. Slope is 15 to 80 percent. Elevation is 1,600 to 6,800 feet. Annual precipitation is 10 to 20 inches. The typical vegetation is mainly chamise, ceanothus, manzanita, Coulter pine, or canyon live oak.

This association makes up about 33 percent of the survey area. It is about 35 percent Trigo soils, 25 percent Lithic Xerorthents, warm soils, and 25 percent Rock outcrop. Components of minor extent make up the remaining 15 percent.

Trigo soils are hilly to very steep have slopes of 15 to 75 percent and are on hills and mountainsides. These soils are shallow and somewhat excessively drained. Typically, they have a coarse sandy loam surface layer. The substratum is coarse sandy loam over highly weathered granitic rock.

Lithic Xerorthents, warm soils are hilly to extremely steep have slopes of 15 to 80 percent and are on hills and mountainsides. These soils are shallow and are somewhat excessively drained and excessively drained. Depth to hard unweathered granitic or metamorphic rock is less than 20 inches. The profile is loam, sandy loam, or coarse sandy loam and is 5 to 80 percent rock fragments, or it is loamy sand and is 35 to 80 percent rock fragments.

Rock outcrop occurs as small isolated rock outcroppings or as large massive exposures.

Of minor extent in this unit are soils of the Wapi, Osito, Modesto, and Pacifico families, and the dry phases of Wapi, Pacifico, and Springdale families.

Most of the soils of this unit are best suited to use as watershed. There are limited areas with slopes of less than 50 percent that have range forage potential.

7. **Springdale Family-Lithic Xerorthents-Rock outcrop**

Very steep and extremely steep, shallow to moderately deep and deep, somewhat excessively drained and excessively drained soils that formed in material weathered from granitic or metamorphic rocks, and Rock Outcrop.

This unit is on mountainsides. Slope is 50 to 90 percent. Elevation is 4,000 to 8,000 feet. Annual precipition is 20 to 35 inches. The typical vegetation is mainly ponderosa pine and Jeffrey pine, canyon live oak, or Coulter pine; above 7,000 feet it is mainly lodgepole pine or white fir.

This association makes up about 22 percent of the survey area. It is about 35 percent Springdale soils, 30 percent Lithic Xerorthents, warm soils, and 20 percent Rock outcrop. Components of minor extent make up the remaining 20 percent.

Springdale soils are very steep have slopes of 50 to 75 percent and are on side slopes of drainages or colluvial areas of mountainsides. These soils are moderately deep and deep and are somewhat excessively drained. Typically, they have a gravelly loamy sand surface layer. The substratum is a very gravelly loamy sand over hard, highly fractured granitic rock.

Lithic Xerorthent soils are very steep and extremely steep, have slopes of 50 to 90 percent and are on mountainsides and narrow ridges. These soils are shallow and are somewhat excessively drained and excessively drained. Depth to hard unweathered granitic or metamorphic rock is less than 20 inches. The profile is loam, sandy loam, or loamy sand and is 35 to 80 percent rock fragments.

Rock Outcrop occurs as small isolated rock outcroppings or as large massive exposures.

Of minor extent in this unit are soils of the Wapal and Goulding families, Lithic Xerorthents, cool and Rubble land.

The soils of this unit support low site class commercial timber but are so steep that intensive management is not now economically feasible.

8. **Lithic Xerorthents, calcareous-Rock Outcrop-Lizzant family**

Hilly to very steep, shallow to moderately deep and deep, well drained to somewhat excessively drained and excessively drained soils that formed in material weathered from limestone, and hilly to extremely steep Rock outcrop.

This unit is on hills and mountainsides. Slope is 15 to 75 percent. Elevation is 5,000 to 8,000 feet. Annual precipitation is 10 to 30 inches. The typical vegetation is mainly pinyon pine, juniper, or scrub oak.

This association makes up about 2 percent of the survey area. It is about 40 percent Lithic Xerorthents, calcareous soils, 25 percent Rock Outcrop, and 20 percent Lizzant soils. Components of minor extent make up the remaining 15 percent.

Lithic Xerorthents, calcareous soils are hilly to very steep have slopes of 15 to 75 percent and are on south to west aspects of the upper slopes and narrow ridges of hills and mountainsides. These soils are shallow and are somewhat excessively drained and excessively drained. Depth to hard unweathered limestone is less than 20 inches. The profile is loam or sandy loam and is 5 to 50 percent rock fragements. It is strongly effervescent below a depth of 4 inches.

Rock outcrop occurs as small isolated rock outcroppings or as large massive exposures.

Lizzant soils are hilly to very steep have slopes of 15 to 50 percent and are on north to east aspects of broad ridges and foot slopes of hills and mountainsides. These soils are moderately deep and deep and are well drained. Typically they have a very cobbly fine sandy loam surface layer. The subsoil is very cobbly fine sandy loam. The substratum is very cobbly sandy loam over hard unweathered limestone.

Of minor extent in this unit are soils of the Avawatz family and the dry phases of the Oak Glen, Pacifico, and Wapi families.

Most of the soils of this unit are best suited to use as watershed. There are areas with slopes of less than 50 percent that have limited potential for woodland and range forage.

Detailed Soil Map Units

The map units on the soil maps located at the back of this report show the kinds of soils in the survey area. Table 2, at the end of the section, gives the acreage and proportionate extent of each map unit. Each map unit on the soil map represents an area on the landscape and consists of one or more soils for which the unit is named. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They can also be used to plan the management needed for those uses.

In this survey, the individual soils (components of map units) were recognized and classified to families or phases of families or to the subgroup level (see "Classification of the Soils"). Soils that have profiles somewhat alike make up a soil family. Soil families are established within a subgroup primarily on the basis of physical and chemical properties that affect use and management. Soils of a family can also differ in slope, wetness, or degree of erosion, and because of such differences, a family is divided into phases.

Many map units are made up of two or more major soils. These map units are called soil complexes or associations. A soil complex consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. A soil association is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated uses, it was considered impractical to map the soils separately. In addition, some map units contain miscellaneous areas as components. Rock outcrop is an example; it has little or no soil and supports little or no vegetation.

Definitions and Criteria

The following are explanations of entries used in detailed soil map unit descriptions.

Map unit symbol and name. A numerical symbol is used to designate areas of each map unit on the soil maps. The symbol corresponds to the symbol preceding the map unit name in the map unit descriptions. The map unit name consists of soil components or miscellaneous areas or both.

Soil map unit components consist mostly of soil families but may include subgroups or higher soil taxa and miscellaneous land types.

Approximate proportion is the approximate percentage of each soil component or miscellaneous land type making up the map unit.

Landscape position describes the type of landform or surface on which the components are found.

A typical vegetation series is listed for each soil component. A series is a natural vegetation unit that has a common dominant species or set of species. Vegetation series are part of a hierarchical stratification used in the Vegetation Classification system for southern California.(U.S. Forest Service and California Department of Fish and Game, April 1978.)

Soil profile description is an abridged version of the more detailed soil profile descriptions in the section "Taxonomic Unit Descriptions". Included are the following layers:

> Surface layer. The uppermost part of the soil, ordinarily moved in tillage, or its equivalent in uncultivated soils; ranging in depth from 3 to 10 inches. Frequently designated as the "A horizon."
>
> Subsoil. The soil between the surface layer and the uppermost substratum. The subsoil consists of all parts of the B horizon above a depth of 2 meters and any part of the A or C horizon between the surface layer and a depth of 1 meter or a more shallow substratum.
>
> Substratum. A layer below a depth of 1 meter, or beneath the solum if the lower part of the solum is between 1 and 2 meters deep. Any part of the solum below 2 meters is considered substratum. Bedrock, hardpan, and unconsolidated geologic materials that are in contrasting particle-size classes relative to the surface soil or solum are substratum regardless of depth, even within 1 meter of the ground surface.

Included areas comprise the other kinds of soils in the map unit that are not named as a component part because they constitute too small a percentage of the unit.

Effective rooting depth is the range of depth that the main body of plant roots extend to, generally to shallow bedrock or to a maximum depth of 60 inches. Other limiting layers include hardpans, claypans, or weathered bedrock.

Available water capacity is the capacity of the soil to store water for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is expressed as total inches of water within the effective rooting depth or to a depth of 60 inches. The following four classes of AWC are used in this survey:

Very low	0 to 2 inches
Low	2 to 4 inches
Moderate	4 to 8 inches
High	more than 8 inches

Water retention class is based on the available water capacity for plants of a typical soil profile to a depth of 20 inches or to bedrock, whichever is less. This moisture content is used in evaluating soils for revegetation according to the probability of survival of seedlings.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. The soils are grouped according to the intake of water when they are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are.

Group A. Low runoff potential. Soils having high rates of infiltration and water transmission when wet. They are mostly deep, well drained to excessively drained sands and gravels.

Group B. Moderately low runoff potential. Soils having moderate rates of infiltration and water transmission when wet. They are mostly moderately deep and deep, moderately well drained and well drained soils, moderately fine to moderately coarse textured and have moderately slow to moderately rapid permeability.

Group C. Moderately high runoff potential. Soils having slow rates of infiltration and water transmission when wet. They belong mostly to one of two general categories. Those in the first category are mostly well drained and moderately well drained soils that have a slowly or very slowly permeable layer (such as a clayplan or hardpan or massive bedrock) at moderate depth (20-40 inches). Those soils in the second category generally have moderately fine or fine textures or a moderately high water table and may be somewhat poorly drained. This group also includes shallow soils over hard but highly fractured bedrock that allows moderate water transmission.

Group D. High runoff potenial. Soils having very slow rates of infiltration and water transmission when wet. They are mostly fine-textured soils that have high shrink-swell potential, soils that have a permanently high water table, soils that have a claypan or a clay layer near the surface, or shallow soils over impervious material.

Some of the soil subgroups (for example, C-B for Calcixerollic Xerochrepts) were given two ratings because of their wide range of characteristics.

Permeability is the quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are: Very slow (less than 0.06 inch), slow (0.06 to 0.20 inches), moderately slow (0.2 to 0.6 inches), moderate (0.6 to 2.0 inches), moderately rapid (2.0 to 6.0 inches), rapid (6.0 to 20 inches), and very rapid (more than 20 inches).

Maximum Erosion Hazard

Many land use activities have the potential to cause erosion rates to exceed natural soil erosion or soil formation rates. Potential consequences of accelerated erosion include reductions in the productive capacity of the soil and adverse effects on water quality. Many interrelated factors are evaluated in an EHR system to determine whether land use activities would cause accelerated erosion, and to what degree accelerated erosion would cause adverse effects. It is designed to appraise the relative risk of accelerated sheet and rill erosion. The system does not rate gully erosion, dry ravel, wind erosion, or mass wasting.

The adjective erosion hazard ratings are described below in terms of the likelihood and consequences of accelerated erosion. As the risk of accelerated erosion increases, so does the likelihood that accelerated erosion will exceed soil formation rates. The risk and consequence becomes especially critical for shallow and moderately deep soils over consolidated materials.

The maximum EHR are based on little or no vegetative cover present and on the long-term average occurrence of 2-year, 6-hour storm events. Erosion hazard risks are greater when storm frequency, intensity and/or duration exceed long-term average occurrence, and risks are less when occurrence is below "average". The risks and consequences for adjective erosion hazard ratings are described below.

Low EHR. Accelerated erosion is not likely to occur, except in the upper part of the Low EHR numerical range, or during periods of above average storm occurrence. If

accelerated erosion does occur, adverse effects on soil productivity and to nearby water quality are not expected. Erosion control measures are usually not needed for these areas.

Moderate EHR. Accelerated erosion is likely to occur in most years. Adverse effects on soil productivity (especially to shallow and moderately deep soils) and to nearby water quality may occur for the upper part of the Moderate EHR numerical range, or during periods of above average storm occurrence. The need for erosion control should be evaluated for these areas. A wide selection of measures and application methods are available.

High EHR. Accelerated erosion will occur in most years. Adverse effects on soil productivity (especially to shallow and moderately deep soils) and to nearby water quality are likely to occur, especially during periods of above average storm occurrence. Erosion control is necessary for these areas to prevent accelerated erosion. The selection of measures and methods of application are somewhat limited.

Very high EHR. Accelerated erosion will occur in most years. Adverse effects on soil productivity and to nearby water quality are very likely to occur, even during periods of below average storm occurrence. Erosion control is essential for these areas to prevent accelerated erosion. The selection of measures and methods of application are limited.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K in the survey area range from 0.05 to 0.27. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Drainage class refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized.

Excessively drained. Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained. Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained. Water is removed from the soil readily but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained. Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. The soils commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained. Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained. Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, or nearly continuous rainfall, or a combination of these.

Very poorly drained. Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Soil manageability. Certain features of the land affect the relative ease of management with mechanized equipment. Soil manageability classification rates soils and their topography on the basis of features that reduce the ease of equipment operation and features that increase the need for soil protection measures.

Soil manageability classes are ratings that are applied to the individual components of a soil map unit. Manageability classes are useful for providing specific

information about individual soils. Because map units may contain soils with contrasting class ratings, soil manageability groups are used to provide general ratings that apply to an entire map unit. Manageability groups are useful for providing general information for large areas.

Soil manageability classes are represented by the numerals 1 to 4. Class 1 is the easiest to manage and class 4 is the most difficult. Letter symbols are added to classes 2, 3, and 4 to identify specific soil problems affecting management. Soil manageability classes are described as follows:

Class 1 - Easy to manage. Soils in this class are on stable slopes with gradients ranging up to about 30 percent. They are moderately deep or deep and do not have more than slight management problems. No management option modifiers apply to this class.

Class 2 - Readily manageable. Soils in this class are mostly on slopes of less than 30 percent and have one or more moderate management limitations, such as a moderate erosion hazard.

Class 3 - Moderately difficult to manage. Soils in this class are on steep slopes that are mostly between 30 and 60 percent, or they have a major management limitation, or both.

Class 4 - Very difficult to manage. Soils in this class are on very steep slopes (more than 60 percent), or they have two or more other major management limitations.

Letter symbols are used to express the severity of potential problems in soil management. Major management option modifiers are identified by capital letters and moderate management modifiers are indicated by lowercase letters. The criteria and symbols for management option modifiers for each soil characteristic or topographic feature are listed in table 1.

TABLE 1. - Soil Features Affecting Management

Soil features	Major modifiers	Moderate modifiers
Slope gradient	G..Mostly more than 60 percent	g..Mostly between 30 and 60 percent
Slope stability	S..Low	s..Moderate
Maximum erosion hazard	E..High or very high	e..Moderate
Soil depth	D..Less than 10 inches	d..10 to 20 inches
AWC, upper 20 inches	P..Less than 1.2 inches	p..1.2 to 2.4 inches
Wetness	W..Poorly drained	w..Somewhat poorly drained
Rock outcrop or surface boulders	X..More than 15 percent of surface	x..3 to 15 percent of surface area

Management option modifiers are chosen in the order in which they are listed. One symbol can be chosen from each of the following groups: (1) symbols G, S, and E (and their lowercase forms); (2) symbols D and P; and (3) symbols W and X. Within each group, symbols for major management limitations take precedence over moderate limitations.

Soil manageability groups are defined by the mix of soil manageability classes that occurs in a soil map unit. They are designated by Roman numerals to distinguish them from soil manageability classes. Only one group applies to a soil map unit, whereas as many classes may apply as there are major components in the map unit. The soil manageability groups in the survey area are defined as follows:

Group I - Map unit is predominantly class 1. Less than 20 percent of the unit is class 3 or class 4. The unit may be no more than 50 percent class 2, or combinations of classes 2, 3, and 4.

Group II - Map unit is predominantly class 2. Less than 20 percent of the unit is class 4. Less than 50 percent of the unit is class 3 or a combination of classes 3 and 4.

Group III - Map unit is predominantly class 3. Less than 40 percent of the unit is class 4.

Group IV - Map unit is at least 40 percent class 4.

A soil map unit is placed in the group with the lowest numeral if group definitions allow the unit to be placed in more than one soil manageability group.

Soil productivity signifies the assessed ability of soils to supply essential nutrients for plant growth. Current knowledge of critical or threshold nutrient levels for native or chaparral species is incomplete. The soil criteria used to make these ratings are: soil depth, presence or absence of a mollic epipedon, particle-size class, mineralogy, and reaction classes. The ratings are: very low, low, moderate, and high.

Production for annual forage is an estimate of the total annual production of forage grasses in pounds per acre (air-dry weight). The estimates generally are based on professional judgment because little if any field data or yield studies were available. These estimates can be verified through project monitoring activities and ecosystem classification.

Forest survey site class. The timber productivity of the soil components is expressed by the Forest Survey Site Class (FSSC). The FSSC estimated for each soil component is an average over the map unit. Site index values were obtained by using available site index data and appropriate guides for converting into FSSC. On a specific site in the map unit, FSSC might be more or less than what is given in the report. FSSC is an expression of the volume of bole wood produced on an acre in one year in a normal even-aged stand at culmination mean annual increment. Below are the seven FSSC's and their corresponding volume in cubic feet per acre:

1	greater than 225
2	165 to 225
3	120 to 165
4	85 to 120
5	50 to 85
6	20 to 50
7	less than 20

The term NC means not capable of growing commercial conifer species.

Chaparral class gives an estimate of the potential of the soils to produce chaparral biomass. Current knowledge of chaparral productivity is incomplete. Soils that do not support chaparral vegetation are rated not applicable (NA). The typical vegetation series and annual precipitation are used as criteria in making the ratings. The soils in the survey area are in chaparral classes 1 to 4. The soils in class 1 annually produce less than 0.3 tons of biomass per acre; those in class 2, 0.3 to 0.6 tons; those in class 3, 0.6 to 0.9 tons; and those in class 4, more than 0.9 tons.

AbD—Soboba - Hanford families association, 2 to 15 percent slopes

Elevation: 1,600 to 4,000 feet Annual Precipitation: 15 to 25 inches

Soil Map Unit Components	**Soboba family**	**Hanford family**
Approximate Proportion	50 percent	30 percent
Landscape Position	Flood plains, along drainageways, and some alluvial fans	Alluvial fans
Slope	2 to 10 percent	5 to 15 percent
Typical Vegetation Series	Chamise, ceanothus, or manzanita (limited areas of Sycamore or Cottonwood in riparian zones)	Chamise, ceanothus, or manzanita

Soil Profile Description

Surface Layer	0 to 8 inches; brown and light olive brown very cobbly loamy sand and sand; massive; soft; pH 7.2	0 to 6 inches; brown sandy loam; weak subangular blocky structure; soft; pH 6.1
Subsoil	8 to 24 inches; grayish brown very cobbly sand; single grain; loose; pH 7.0	6 to 60 inches; pale brown sandy loam; massive; slightly hard; pH 6.5
Substratum	24 to 60 inches; stratified yellowish brown very cobbly loamy fine sand and sand; single grain; loose; pH 7.0 60 inches; mixed alluvium	60 inches; mixed alluvium

Soil Properties & Management Interpretations

Effective Rooting Depth	60	60
Available Water Capacity	Very low	Moderate
Water Retention Class	3	2
Hydrologic Soil Group	A	B
Permeability	Very rapid	Moderately rapid
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.08	.20
Drainage Class	Excessively drained	Well drained
Soil Manageability		
Group	II	II
Class	2Pe	2pe
Soil Productivity	Very low	Moderate
Forage Production Class	2	3
Forest Survey Site Class	NC	NC
Chaparral Class	2	3

Included Areas and Remarks: Included in this unit are areas of Riverwash and soils that are similar to those of the Soboba family but have less than 35 percent rock fragments throughout the soil profile. Included areas make up 20 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

AeD—Oak Glen family - Riverwash association, 2 to 15 percent slopes

Elevation: 3,200 to 6,000 feet Annual Precipitation: 25 to 35 inches

Soil Map Unit Components	**Oak Glen family**	**Riverwash**
Approximate Proportion	60 percent	15 percent
Landscape Position	Alluvial fans and in some drainageways	Drainageways
Slope	5 to 15 percent	2 to 10 percent
Typical Vegetation Series	Coulter pine, ponderosa pine, Jeffrey pine, or canyon live oak	Barren

Soil Profile Description

Surface Layer	0 to 15 inches; dark grayish brown sandy loam; massive; soft; pH 7.0	Riverwash consists of unstabilized sandy, gravelly, cobbly, or stony material that is flooded, washed, and reworked by rivers so frequently that it supports little or no vegetation.
Subsoil	15 to 30 inches; dark grayish brown sandy loam; massive; soft; pH 6.8	
Substratum	30 to 60 inches; grayish brown sandy loam; massive; slightly hard; pH 6.8 60 inches; mixed alluvium	

Soil Properties & Management Interpretations

Effective Rooting Depth	60
Available Water Capacity	Moderate
Water Retention Class	2
Hydrologic Soil Group	B
Permeability	Moderately rapid
Maximum Erosion Hazard	Moderate
Erosion Factor K	.17
Drainage Class	Well drained
Soil Manageability	
Group	II
Class	2pe
Soil Productivity	Moderate
Forage Production Class	5
Forest Survey Site Class	5
Chaparral Class	NA
Included Areas and Remarks:	Included in this unit are areas of soils of the Wilshire and Avawatz families in drainageways and on flood plains and similar soils with a lighter colored surface layer or with more sand throughout the soil profile. Included areas make up 25 percent of the unit. Erosion on the Oak Glen soil can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

BeDE—Wrightwood - Morical, dry families association, 2 to 30 percent slopes

Elevation: 3,700 to 5,000 feet Annual Precipitation: 8 to 20 inches

Soil Map Unit Components	**Wrightwood family**	**Morical family, dry**
Approximate Proportion	50 percent	25 percent
Landscape Position	Older terrace remnants that are smooth, convex, and narrow	Ridge crests and toe slopes of terrace remnants that have begun to be incised by streams
Slope	2 to 15 percent	10 to 30 percent
Typical Vegetation Series	Juniper-scrub oak-pinyon, manzanita, or chamise	Juniper-scrub oak-pinyon, manzanita, or chamise

Soil Profile Description

Surface Layer	0 to 5 inches; yellowish brown gravelly sandy loam; weak granular structure; soft; pH 6.8	0 to 4 inches; brown gravelly loam; moderate granular structure; hard; pH 6.5
Subsoil	5 to 38 inches; yellowish brown and light yellowish brown fine sandy loam; weak subangular blocky structure; slightly hard; pH 7.0	4 to 23 inches; light yellowish brown gravelly clay loam; moderate subangular blocky structure; hard; pH 6.5 23 to 39 inches; light yellowish brown loam; moderate subangular blocky structure; hard; pH 6.5
Substratum	38 to 60 inches; light yellowish brown sandy loam; massive; very hard; pH 7.0 60 inches; weakly cemented alluvium	39 to 60 inches; light yellowish brown sandy loam; massive; hard; pH 7.0 60 inches; weakly cemented alluvium

Soil Properties & Management Interpretations

Effective Rooting Depth	60	60
Available Water Capacity	Moderate	Moderate
Water Retention Class	2	1
Hydrologic Soil Group	B	B
Permeability	Moderately rapid	Moderately slow
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.21	.20
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	II	II
Class	2pe	2e
Soil Productivity	Very low	Very low
Forage Production Class	3	4
Forest Survey Site Class	NC	NC
Chaparral Class	2	3

Included Areas and Remarks: Included in this unit are areas of Typic Xerorthents on terrace escarpments, Badland, soils of the Avawatz family in drainageways and on flood plains, and soils in Garner Valley that are similar to those of Morical family, dry but have more than 35 percent rock fragments throughout the soil profile. Included areas make up 25 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

BeF—Morical, dry - Wrightwood families association, 30 to 50 percent slopes

Elevation: 3,700 to 5,000 feet Annual Precipitation: 8 to 20 inches

Soil Map Unit Components	**Morical family, dry**	**Wrightwood family**
Approximate Proportion	50 percent	25 percent
Landscape Position	Terrace remnants, consisting of crests, toe slopes, and side slopes of ridges that have begun to be incised by streams	Old terrace remnants that are smooth, convex, and narrow
Slope	30 to 50 percent	30 to 40 percent
Typical Vegetation Series	Manzanita or chamise	Manzanita or chamise

Soil Profile Description

Surface Layer	0 to 4 inches; brown gravelly loam; moderate granular structure; hard; pH 6.5	0 to 5 inches; yellowish brown gravelly sandy loam; weak granular structure; soft; pH 6.8
Subsoil	4 to 23 inches; light yellowish brown gravelly clay loam; moderate subangular blocky structure; hard; pH 6.5 23 to 39 inches; light yellowish brown loam; moderate subangular blocky structure; hard; pH 6.5	5 to 38 inches; yellowish brown and light yellowish brown fine sandy loam; weak subangular blocky structure; slightly hard; pH 7.0
Substratum	39 to 60 inches; light yellowish brown sandy loam; massive; hard; pH 7.0 60 inches; weakly cemented alluvium	38 to 60 inches; light yellowish brown sandy loam; massive; very hard; pH 7.0 60 inches; weakly cemented alluvium

Soil Properties & Management Interpretations

Effective Rooting Depth	60	60
Available Water Capacity	Moderate	Moderate
Water Retention Class	1	2
Hydrologic Soil Group	B	B
Permeability	Moderately slow	Moderately rapid
Maximum Erosion Hazard	High	High
Erosion Factor K	.20	.21
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	III	III
Class	3Eg	3Egp
Soil Productivity	Very low	Very low
Forage Production Class	4	3
Forest Survey Site Class	NC	NC
Chaparral Class	3	2

Included Areas and Remarks: Included in this unit are areas of Typic Xerorthents on terrace escarpments and soils that are similar to those of the Morical family, dry, but have more than 35 percent rock fragments throughout the soil profile. Included areas make up 25 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

BgEF—Morical family, dry - Badland association, 15 to 50 percent slopes

Elevation: 3,700 to 4,500 feet Annual Precipitation: 8 to 20 inches

Soil Map Unit Components	**Morical family, dry**	**Badland**
Approximate Proportion	50 percent	25 percent
Landscape Position	Ridge crests, toe slopes and side slopes of ridges on terrace remnants	Terrace escarpments
Slope	15 to 40 percent	30 to 50 percent
Typical Vegetation Series	Juniper-scrub oak-pinyon	Barren

Soil Profile Description

Surface Layer	0 to 4 inches; brown gravelly loam; moderate granular structure; hard; pH 6.5	Badland is steep, barren land dissected by many intermittent drainageways. Runoff is very high, and geologic erosion is very active.
Subsoil	4 to 23 inches; light yellowish brown gravelly clay loam; moderate subangular blocky structure; hard; pH 6.5 23 to 39 inches; light yellowish brown loam; moderate subangular blocky structure; hard; pH 6.5	
Substratum	39 to 60 inches; light yellowish brown sandy loam; massive; hard; pH 7.0 60 inches; weakly cemented alluvium	

Soil Properties & Management Interpretations

Effective Rooting Depth	60
Available Water Capacity	Moderate
Water Retention Class	1
Hydrologic Soil Group	B
Permeability	Moderately slow
Maximum Erosion Hazard	Moderate to high
Erosion Factor K	.20
Drainage Class	Well drained
Soil Manageability	
Group	II
Class	2e - 3Eg
Soil Productivity	Very low
Forage Production Class	4
Forest Survey Site Class	NC
Chaparral Class	3
Included Areas and Remarks:	Included in this unit are areas of soils of the Wrightwood family, Avawatz families in drainageways and on flood plains, and soils that are similar to those of the Morical family, dry, but are less than 20 inches deep to soft sedimentary rock. Included areas make up 25 percent of the unit. Erosion on the Morical family, dry can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

BoD—Morical, very deep - Hecker families complex, 2 to 15 percent slopes

Elevation: 5,000 to 7,800 feet Annual Precipitation: 25 to 35 inches

Soil Map Unit Components	**Morical family, very deep**	**Hecker family**
Approximate Proportion	50 percent	25 percent
Landscape Position	Alluvial fans and terraces	Alluvial fans and terraces
Slope	2 to 15 percent	2 to 15 percent
Typical Vegetation Series	Mixed conifer or black oak	Mixed conifer or black oak

Soil Profile Description

Surface Layer	0 to 6 inches; brown gravelly loam; weak granular structure; hard; pH 6.7	0 to 6 inches; dark brown gravelly fine sandy loam; weak granular structure; soft; pH 7.2
Subsoil	6 to 36 inches; reddish yellow gravelly sandy clay loam; moderate subangular blocky structure; very hard; pH 6.7	6 to 50 inches; yellowish brown very gravelly fine sandy loam; weak subangular blocky structure; slightly hard; pH 6.5
Substratum	36 to 60 inches; light brown gravelly sandy loam; massive; slightly hard; pH 7.0 60 inches; partially consolidated alluvium	50 to 60 inches; very pale brown extremely gravelly loam; massive; slightly hard; pH 6.5 60 inches; partially consolidated alluvium

Soil Properties & Management Interpretations

Effective Rooting Depth	60	60
Available Water Capacity	Moderate	Low
Water Retention Class	1	2
Hydrologic Soil Group	B	B
Permeability	Moderately slow	Moderate
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.17	.20
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	II	II
Class	2e	2pe
Soil Productivity	High	Moderate
Forage Production Class	6	4
Forest Survey Site Class	4	4
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of soils of the Oak Glen and Hodgson families and soils of the Wilshire family in the drainageways and flood plains of the Santa Ana River. Included areas make up 25 percent of the unit. In areas of lower rainfall, these soils support juniper, pinyon pine, or Jeffrey pine (e.g., east end of Big Bear Lake). Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

BoE—Morical, very deep - Hecker families complex, 15 to 30 percent slopes

Elevation: 5,000 to 7,800 feet Annual Precipitation: 25 to 35 inches

Soil Map Unit Components	**Morical family, very deep**	**Hecker family**
Approximate Proportion	50 percent	25 percent
Landscape Position	Alluvial fans and terraces	Alluvial fans and terraces
Slope	15 to 30 percent	15 to 30 percent
Typical Vegetation Series	Mixed conifer or black oak	Mixed conifer or black oak

Soil Profile Description

Surface Layer	0 to 6 inches; brown gravelly loam; weak granular structure; hard; pH 6.7	0 to 6 inches; dark brown gravelly fine sandy loam; weak granular structure; soft; pH 7.2
Subsoil	6 to 36 inches; reddish yellow gravelly sandy clay loam; moderate subangular blocky structure; very hard; pH 6.7	6 to 50 inches; yellowish brown very gravelly fine sandy loam; weak subangular blocky structure; slightly hard; pH 6.5
Substratum	36 to 60 inches; light brown gravelly sandy loam; massive; slightly hard; pH 7.0 60 inches; slightly consolidated alluvium	50 to 60 inches; very pale brown extremely gravelly loam; massive; slightly hard; pH 6.5 60 inches; slightly consolidated alluvium

Soil Properties & Management Interpretations

Effective Rooting Depth	60	60
Available Water Capacity	Moderate	Low
Water Retention Class	1	2
Hydrologic Soil Group	B	B
Permeability	Moderately slow	Moderate
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.17	.20
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	II	II
Class	2e	2ep
Soil Productivity	Moderate	Moderate
Forage Production Class	6	4
Forest Survey Site Class	4	4
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of soils of the Hodgson family, soils at elevations of more than 7,800 feet that have a mean annual soil temperature of less than 47 degrees F and that support Jeffrey pine and white fir, and very stony, sandy soils that formed in glacial outwash (South Fork Meadows). Included areas make up 25 percent of the unit. In areas of lower rainfall, these soils support juniper, pinyon pine, or Jeffrey pine (e.g., east of Big Bear Lake). Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

BoF—Hecker - Morical, very deep families complex, 30 to 50 percent slopes

Elevation: 5,000 to 7,800 feet Annual Precipitation: 25 to 35 inches

Soil Map Unit Components	**Hecker family**	**Morical family very deep**
Approximate Proportion	50 percent	20 percent
Landscape Position	Side slopes of dissected alluvial fans and terraces	Side slopes of dissected alluvial fans and terraces
Slope	30 to 50 percent	30 to 50 percent
Typical Vegetation Series	Mixed conifer or black oak	Mixed conifer or black oak

Soil Profile Description

Surface Layer	0 to 6 inches; dark brown gravelly fine sandy loam; weak granular structure; soft; pH 7.2	0 to 6 inches; brown gravelly loam; weak granular structure; hard; pH 6.7
Subsoil	6 to 50 inches; yellowish brown very gravelly fine sandy loam; weak subangular blocky structure; slightly hard; pH 6.5	6 to 36 inches; reddish yellow gravelly sandy clay loam; moderate subangular blocky structure; very hard; pH 6.7
Substratum	50 to 60 inches; very pale brown extremely gravelly loam; massive; slightly hard; pH 6.5 60 inches; slightly consolidated alluvium	36 to 60 inches; light brown gravelly sandy loam; massive; slightly hard; pH 7.0 60 inches; slightly consolidated alluvium

Soil Properties & Management Interpretations

Effective Rooting Depth	60	60
Available Water Capacity	Low	Moderate
Water Retention Class	2	1
Hydrologic Soil Group	B	B
Permeability	Moderate	Moderately slow
Maximum Erosion Hazard	Moderate	High
Erosion Factor K	.20	.17
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	III	III
Class	3epg	3eg
Soil Productivity	Moderate	Moderate
Forage Production Class	4	6
Forest Survey Site Class	4	4
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of similar soils that have a deep dark colored surface layer or have more sand throughout the soil profile, or both; soils at elevations of more than 7,800 feet that have a mean annual soil temperature of less than 47 degrees F, that support Jeffrey pine and white fir, and that have slopes of 50 to 70 percent; and soils of the Brader family that are underlain by sandstone. Included areas make up 30 percent of the unit.

CaD—Cagey family - Riverwash association, 2 to 15 percent slopes

Elevation: 4,400 to 4,800 feet Annual Precipitation: 20 to 25 inches

Soil Map Unit Components	**Cagey family**	**Riverwash**
Approximate Proportion	70 percent	15 percent
Landscape Position	Flood plains and valley floors	Drainageways
Slope	2 to 15 percent	2 to 10 percent
Typical Vegetation Series	Wild Rye or sedge	Barren

Soil Profile Description

Surface Layer	0 to 5 inches; brown sand; massive; soft; pH 7.0	Riverwash consists of unstabilized sandy, gravelly, cobbly, or stony material that is flooded, washed, and reworked by rivers so frequently that it supports little or no vegetation.
Subsoil	5 to 9 inches; pale brown sand; single grain; loose; pH 7.0	
Substratum	9 to 60 inches; very pale brown stratified coarse sand and loamy sand; single grain; loose; pH 7.0 60 inches; mixed alluvium	

Soil Properties & Management Interpretations

Effective Rooting Depth	60
Available Water Capacity	Low
Water Retention Class	2
Hydrologic Soil Group	A
Permeability	Rapid
Maximum Erosion Hazard	Moderate
Erosion Factor K	.10
Drainage Class	Somewhat poorly drained
Soil Manageability	
Group	II
Class	2wep
Soil Productivity Class	Moderate
Forage Production Class	5
Forest Survey Site Class	NC
Chaparral Class	NA
Included Areas and Remarks:	Included in this unit are areas of soils of the Oak Glen family on alluvial fans and soils of the Avawatz family. Included areas make up 15 percent of the unit. Available water in the Cagey soil is higher than indicated, because this soil has a seasonally high water table. The main limitation of the Cagey soil is wetness caused by the seasonally high water table. Cagey soils are located in Garner Valley.

ChDE—Ramona family - Typic Xerorthents, warm association, 2 to 30 percent slopes

Elevation: 2,000 to 4,000 feet Annual Precipitation: 15 to 25 inches

Soil Map Unit Components	**Ramona family**	**Typic Xerorthents, warm**
Approximate Proportion	60 percent	20 percent
Landscape Position	Smooth linear side slopes of dissected terraces	Ridge crests and upper side slopes of dissected terraces
Slope	2 to 20 percent	10 to 30 percent
Typical Vegetation Series	Chamise, manzanita, ceanothus, or minor areas of coastal sagebrush	Chamise, manzanita, ceanothus, or minor areas of coastal sagebrush

Soil Profile Description

Surface Layer	0 to 8 inches: brown sandy loam; weak granular structure; slightly hard; pH 6.1	Shallow to moderately deep soils underlain by soft, weakly consolidated sedimentary rock. They are loam or sandy loam and are 0 to 20 percent rock fragments. Mean annual soil temperature is 59 to 70 degrees F.
Subsoil	8 to 60 inches; brown cobbly sandy clay loam; moderate subangular blocky structure; very hard; pH 6.6	
Substratum	60 to 70 inches; yellowish brown gravelly loamy coarse sand; single grain; loose; pH 6.6 70 inches; mixed alluvium	

Soil Properties & Management Interpretations

Effective Rooting Depth	60	10 to 40
Available Water Capacity	Moderate	Very low to low
Water Retention Class	2	2-3
Hydrologic Soil Group	B	B or C
Permeability	Moderately slow	Moderately rapid to very rapid
Maximum Erosion Hazard	Moderate	High
Erosion Factor K	.21	
Drainage Class	Well drained	Somewhat excessively drained
Soil Manageability		
Group	II	II
Class	2ep	2Edp-2EPd
Soil Productivity	Moderate	Very low to moderate
Forage Production Class	4	1-3
Forest Survey Site Class	NC	NC
Chaparral Class	3	2-3

Included Areas and Remarks: Included in this unit are areas of Badland. On the old terraces of the San Bernardino Mountains the soils of the Ramona family make up 90 percent of the mapped area and are intermingled with minor areas of soils with more clay throughout the soil profile. Included areas make up 20 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

ChFG—Typic Xerorthents, warm-Typic Haploxeralfs - Badland complex, 30 to 100 percent slopes

Elevation: 2,000 to 4,000 feet Annual Precipitation: 10 to 25 inches

Soil Map Unit Components	**Typic Xerorthents, warm**	**Typic Haploxeralfs**	**Badland**
Approximate Proportion	35 percent	30 percent	15 percent
Landscape Position	Ridge crests and upper side slopes of dissected terraces	Smooth linear side slopes of dissected terraces	Terrace escarpments
Slope	40 to 70 percent	30 to 50 percent	70 to 100 percent
Typical Vegetation Series	Chamise, manzanita, ceanothus, minor areas of coastal sagebrush or juniper-scrub oak-pinyon	Chamise, manzanita, ceanothus, minor areas of coastal sagebrush or juniper-scrub oak-pinyon	Barren

Soil Profile Description

Surface Layer	Shallow to moderately deep soils underlain by soft, weakly consolidated sedimentary rock. They are loam or sandy loam and contain 0 to 20 percent rock fragments. Mean annual soil temperature is 59 to 70 degrees F.	Moderately deep to deep soils underlain by soft, weakly consolidated sedimentary rock. They are brown sandy loam in the surface layer and light yellowish brown loam or sandy clay loam in the subsoil. The substratum is very pale brown gravelly sandy loam. Mean annual soil temperature is 59 to 70 degrees F.	Badland is steep, barren land that is dissected by many intermittent drainageways. Runoff is very high, and geologic erosion is active.
Subsoil			
Substratum			

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 40	20 to 50
Available Water Capacity	Very low to low	Low to moderate
Water Retention Class	2-3	1-2
Hydrologic Soil Group	B or C	B
Permeability	Moderately rapid to very rapid	Moderately slow
Maximum Erosion Hazard	Very high	High
Erosion Factor K		
Drainage Class	Somewhat excessively drained	Well drained
Soil Manageability		
Group	III	III
Class	4GEdp-4GEPd	3Eg-3Epg
Soil Productivity	Very low to moderate	Low to moderate
Forage Production Class	NC	1-4
Forest Survey Site Class	NC	NC
Chaparral Class	2-3	3

Included Areas and Remarks: Included in this unit are areas of soils of the Hanford family on alluvial fans where slopes are 2 to 15 percent and Ramona family where slopes are 15 to 30 percent. Included areas make up 20 percent of the unit. Typic Xerorthents, warm soils have a high potential for movement due to dry ravel if the protective cover is removed.

CmE—Modesto - Osito families association, 15 to 30 percent slopes

Elevation: 1,800 to 4,200 feet Annual Precipitation: 15 to 25 inches

Soil Map Unit Components	**Modesto family**	**Osito family**
Approximate Proportion	40 percent	30 percent
Landscape Position	Broad rounded ridges (north to east aspects) and foot slopes of hills	Narrow ridges (south to west aspects) and upper slopes of hills
Slope	15 to 30 percent	15 to 30 percent
Typical Vegetation Series	Chamise, manzanita, ceanothus, or interior live oak	Chamise, manzanita, ceanothus, or interior live oak

Soil Profile Description

Surface Layer	0 to 5 inches; yellowish brown fine sandy loam; moderate granular structure, blocky; slightly hard; pH 7.0	0 to 5 inches; pale brown coarse sandy loam; weak granular structure; soft; pH 7.0
Subsoil	5 to 28 inches; brown loam; moderate subangular blocky structure; very hard; pH 6.5	5 to 13 inches; very pale brown coarse sandy loam; moderate subangular blocky structure; soft; pH 7.0
Substratum	28 to 50 inches; brownish yellow fine sandy loam; moderate subangular blocky structure; very hard; pH 6.5 50 inches; highly weathered fractured granite	13 inches; highly weathered granite

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 60	10 to 20
Available Water Capacity	Moderate	Very low
Water Retention Class	1	3
Hydrologic Soil Group	C	C
Permeability	Moderately slow	Moderately rapid
Maximum Erosion Hazard	Moderate	High
Erosion Factor K	.26	.19
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	II	II
Class	2e	2EPd
Soil Productivity	Moderate	Very low
Forage Production Class	4	2
Forest Survey Site Class	NC	NC
Chaparral Class	3	2

Included Areas and Remarks: Included in this unit are areas of soils of the Trigo and San Andreas families, Rock outcrop, and soils of the Ramona family on old terraces where slopes are 5 to 15 percent. Included areas make up 30 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will improve available water capacity.

CmF—Osito - Modesto families association, 30 to 50 percent slopes

Elevation: 1,800 to 4,200 feet Annual Precipitation: 15 to 25 inches

Soil Map Unit Components	**Osito family**	**Modesto family**
Approximate Proportion	40 percent	30 percent
Landscape Position	Narrow ridges (south to west aspects) and upper slopes of mountainsides	Broad rounded ridges (north to east aspects) and lower slopes of mountainsides
Slope	30 to 50 percent	30 to 40 percent
Typical Vegetation Series	Chamise, manzanita, ceanothus, or interior live oak	Chamise, manzanita, ceanothus, or interior live oak

Soil Profile Description

Surface Layer	0 to 5 inches; pale brown coarse sandy loam; weak granular structure; soft; pH 7.0	0 to 5 inches; yellowish brown loam; moderate granular structure; slightly hard; pH 7.0
Subsoil	5 to 13 inches; very pale brown coarse sandy loam; moderate subangular blocky structure; soft; pH 7.0	5 to 28 inches; brown loam; moderate subangular blocky structure; hard and very hard; pH 6.5
Substratum	13 inches; highly weathered fractured sandstone	28 to 50 inches; brownish yellow fine sandy loam; moderate subangular blocky structure; very hard; pH 6.5 50 inches; highly weathered fractured granite

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	20 to 60
Available Water Capacity	Very low	Moderate
Water Retention Class	3	1
Hydrologic Soil Group	C	C
Permeability	Moderately rapid	Moderately slow
Maximum Erosion Hazard	Very high	High
Erosion Factor K	.19	.26
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	III	III
Class	3EPdg	3Eg
Soil Productivity	Very low	Moderate
Forage Production Class	2	4
Forest Survey Site Class	NC	NC
Chaparral Class	2	3

Included Areas and Remarks: Included in this unit area areas of Rock outcrop, soils of the Trigo and San Andreas families, and soils of Ramona family on old terraces where slopes are 10 to 30 percent. Included areas make up 30 percent of the unit.

CoDE—Corbett - Wapal families association, 2 to 30 percent slopes

Elevation: 7,100 to 9,600 feet Annual Precipitation: 30 to 40 inches

Soil Map Unit Components	**Corbett family**	**Wapal family**
Approximate Proportion	40 percent	30 percent
Landscape Position	Foot slopes of hills	Upper slopes of hills and ridges
Slope	2 to 30 percent	10 to 30 percent
Typical Vegetation Series	Ponderosa/Jeffrey pine, white fir, lodgepole pine, or limber pine	Ponderosa/Jeffrey pine, white fir, lodgepole pine, or limber pine

Soil Profile Description

Surface Layer	0 to 5 inches; dark grayish brown gravelly sandy loam; weak granular structure; soft; pH 7.0	0 to 3 inches; light olive brown very gravelly sandy loam; weak granular structure; soft; pH 6.4
Subsoil	6 to 25 inches; pale brown and olive yellow gravelly loamy sand; massive and soft or single grain and loose; pH 6.5	3 to 27 inches; light yellowish brown very gravelly loamy sand; single grain; loose; pH 6.2
Substratum	25 inches; highly weathered granite	27 to 40 inches; light yellowish brown extremely gravelly loamy sand; single grain; loose; pH 6.3 40 inches; highly fractured granite

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 40	20 to 60
Available Water Capacity	Very low	Very low
Water Retention Class	2	3
Hydrologic Soil Group	B	B
Permeability	Rapid	Very rapid
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.16	.10
Drainage Class	Somewhat excessively drained	Somewhat excessively drained
Soil Manageability Group Class	 II 2ep	 II 2XPe
Soil Productivity	Moderate	Low
Forage Production Class	4	3
Forest Survey Site Class	5	6
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of soils that are similar to Oak Glen family but have a mean annual soil temperature of less than 47 degrees (on alluvial fans or in drainageways); Lithic Xerorthents, cool; and Rock outcrop (associated with soils of the Wapal family). Included areas make up 30 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

DaE—Pacifico - Wapi families complex, 15 to 30 percent slopes

Elevation: 5,000 to 8,000 feet Annual Precipitation: 20 to 35 inches

Soil Map Unit Components	**Pacifico family**	**Wapi family**
Approximate Proportion	55 percent	15 percent
Landscape Position	Hillsides	Hillsides
Slope	15 to 30 percent	15 to 30 percent
Typical Vegetation Series	Ponderosa/Jeffrey pine, Coulter pine, canyon live oak, or black oak	Coulter pine, canyon live oak, ponderosa/Jeffrey pine, or black oak

Soil Profile Description

Surface Layer	0 to 3 inches; grayish brown loamy coarse sand; weak granular structure; soft; pH 6.5	0 to 7 inches; grayish brown loamy sand; massive; soft; pH 6.8
Subsoil	3 to 15 inches; light yellowish brown loamy coarse sand; massive; soft; pH 6.5	7 to 10 inches; light yellowish brown gravelly loamy sand; massive; soft; pH 6.5
Substratum	15 to 20 inches; highly weathered granodiorite	10 to 15 inches; highly weathered granite; 15 inches; hard fractured granite

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	3	3
Hydrologic Soil Group	C	C
Permeability	Rapid	Rapid
Maximum Erosion Hazard	High	High
Erosion Factor K	.17	.16
Drainage Class	Somewhat excessively drained	Somewhat excessively drained
Soil Manageability Group Class	 II 2EPd	 II 2EPd
Soil Productivity	Low	Low
Forage Production Class	3	3
Forest Survey Site Class	6	7
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of Rock outcrop, soils of the Preston family, and soils similar to soils in this unit but with dark colored surface layers. In the Onyx Peak area, there are similar soils at elevations above 8,000 feet that have a mean annual soil temperature of less than 47 degrees F. There are also areas east of Big Bear Lake which support pinyon pine and juniper as a result of the lower rainfall; these soils are borderline "dry" phases. Included areas make up 30 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

DaF—Pacifico - Wapi families complex, 30 to 50 percent slopes

Elevation: 4,800 to 7,800 feet Annual Precipitation: 20 to 35 inches

Soil Map Unit Components	**Pacifico family**	**Wapi family**
Approximate Proportion	50 percent	20 percent
Landscape Position	Mountainsides	Mountainsides
Slope	30 to 50 percent	30 to 50 percent
Typical Vegetation Series	Ponderosa/Jeffrey pine, Coulter pine, or canyon live oak	Coulter pine, canyon live oak, ponderosa/Jeffrey pine, or black oak

Soil Profile Description

Surface Layer	0 to 3 inches; grayish brown loamy coarse sand; weak granular structure; soft; pH 6.5	0 to 7 inches; grayish brown loamy sand; massive; soft; pH 6.8
Subsoil	3 to 15 inches; light yellowish brown loamy coarse sand; massive; soft; pH 6.5	7 to 10 inches; light yellowish brown gravelly loamy sand; massive; soft; pH 6.5
Substratum	15 to 20 inches; highly weathered granodiorite	10 to 15 inches; highly weathered granite 15 inches; hard fractured granite

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	3	3
Hydrologic Soil Group	C	C
Permeability	Rapid	Rapid
Maximum Erosion Hazard	High	High
Erosion Factor K	.17	.16
Drainage Class	Somewhat excessively drained	Somewhat excessively drained
Soil Manageability Group Class	 III 3EPdg	 III 3EPdg
Soil Productivity	Low	Low
Forage Production Class	3	3
Forest Survey Site Class	6	7
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of Rock outcrop, soils of the Preston family, soils that are similar to the soils in this unit but have dark colored surface layers, and soils at elevations above 8,000 feet (Onyx Peak area) that have a mean annual soil temperature under 47 degrees F. There are also areas of borderline "dry" phases which support pinyon pine and juniper. Included areas make up 30 percent of the unit.

DaG—Wapi-Pacifico families - Rock outcrop complex, 50 to 75 percent slopes

Elevation: 4,000 to 7,800 feet Annual Precipitation: 20 to 35 inches

Soil Map Unit Components	Wapi family	Pacifico family	Rock outcrop
Approximate Proportion	35 percent	30 percent	15 percent
Landscape Position	Mountainsides	Mountainsides	Mountainsides
Slope	50 to 75 percent	50 to 75 percent	50 to 75 percent
Typical Vegetation Series	Coulter pine, canyon live oak, ponderosa/ Jeffrey pine, or black oak	Ponderosa/Jeffrey pine, Coulter pine, canyon live oak, or black oak	Barren

Soil Profile Description

Surface Layer	0 to 7 inches; grayish brown loamy sand; massive; soft; pH 6.8	0 to 3 inches; grayish brown loamy sand; weak granular structure; soft; pH 6.5	Rock outcrop consists of exposed bedrock with less than 15 percent included areas of soil material capable of supporting vegetation.
Subsoil	7 to 10 inches; light yellowish brown gravelly loamy sand; massive; soft; pH 6.5	3 to 15 inches; light yellowish brown loamy coarse sand; massive; soft; pH 6.5	
Substratum	10 to 15 inches; highly weathered granite 15 inches; hard fractured granitic rock	15 to 20 inches; highly weathered granodiorite	

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	3	3
Hydrologic Soil Group	C	C
Permeability	Rapid	Rapid
Maximum Erosion Hazard	Very high	Very high
Erosion Factor K	.16	.17
Drainage Class	Somewhat excessively drained	Somewhat excessively drained
Soil Manageability		
Group	IV	IV
Class	4EPGd	4EPGd
Soil Productivity	Low	Low
Forage Production Class	NC	NC
Forest Survey Site Class	7	6
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of soils of the Preston and Springdale families and Lithic Xerorthents. Included areas make up 20 percent of the unit. The soils in this unit have a high potential for movement due to dry ravel if the protective cover is removed.

DcDE—Morical - Brader families association, 2 to 30 percent slopes

Elevation: 4,400 to 6,000 feet Annual Precipitation: 20 to 30 inches

Soil Map Unit Components	**Morical family**	**Brader family**
Approximate Proportion	50 percent	30 percent
Landscape Position	Lower slopes or in concave areas of hills	Upper slopes and ridges of hills
Slope	2 to 20 percent	15 to 30 percent
Typical Vegetation Series	Coulter pine, black oak, or ponderosa/Jeffrey pine	Coulter pine or pinyon pine

Soil Profile Description

Surface Layer	0 to 8 inches; grayish brown loam; moderate granular structure; hard; pH 7.0	0 to 3 inches; brown gravelly loamy coarse sand; weak granular structure; soft; pH 6.5
Subsoil	8 to 50 inches; brownish yellow and yellowish brown loam; moderate subangular blocky structure; hard; pH 6.5	3 to 16 inches; yellowish brown gravelly coarse sandy loam; weak subangular blocky structure; soft; pH 6.5
Substratum	50 inches; highly weathered granodiorite	16 to 19 inches; light yellowish brown very gravelly loamy coarse sand; massive; soft; pH 6.0 19 inches; highly weathered granite

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 50	10 to 20
Available Water Capacity	Moderate	Very low
Water Retention Class	1	3
Hydrologic Soil Group	B	C
Permeability	Moderately slow	Moderately rapid
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.23	.16
Drainage Class	Well drained	Somewhat excessively drained
Soil Manageability		
Group	II	II
Class	2e	2Pde
Soil Productivity	Moderate	Low
Forage Production Class	5	3
Forest Survey Site Class	5	6
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of Olete and Goulding families and soils that are similar to soils in this unit but that have a thick dark surface layer. Included areas make up 20 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

DcF—Brader - Morical families association, 30 to 50 percent slopes

Elevation: 4,400 to 6,000 feet Annual Precipitation: 20 to 30 inches

Soil Map Unit Components	**Brader family**	**Morical family**
Approximate Proportion	55 percent	20 percent
Landscape Position	Upper slopes (south to west aspects) of mountainsides	Foot slopes (north to east aspects) of mountainsides
Slope	30 to 50 percent	30 to 40 percent
Typical Vegetation Series	Coulter pine or pinyon pine	Coulter pine, black oak, or ponderosa/Jeffrey pine

Soil Profile Description

Surface Layer	0 to 3 inches; brown gravelly loamy coarse sand; weak granular structure; soft; pH 6.5	0 to 8 inches; grayish brown loam; moderate granular structure; hard; pH 7.0
Subsoil	3 to 16 inches; yellowish brown gravelly coarse sandy loam; weak subangular blocky structure; soft; pH 6.5	8 to 50 inches; brownish yellow and yellowish brown clay loam; moderate subangular blocky structure; hard; pH 6.5
Substratum	16 to 19 inches; light yellowish brown very gravelly loamy coarse sand; massive; soft; pH 6.0 19 inches; highly weathered granite	50 inches; highly fractured granodiorite

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	20 to 50
Available Water Capacity	Very low	Moderate
Water Retention Class	3	1
Hydrologic Soil Group	C	B
Permeability	Moderately rapid	Moderately slow
Maximum Erosion Hazard	High	High
Erosion Factor K	.16	.23
Drainage Class	Somewhat excessively drained	Well drained
Soil Manageability		
Group	II	III
Class	3PEdg	3Eg
Soil Productivity	Low	Moderate
Forage Production Class	3	5
Forest Survey Site Class	6	5
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of Rock outcrop, soils of the Pacifico family, and soils that are similar to the soils in this unit but have a deep dark surface layer. Included areas make up 25 percent of the unit.

DdDE—Pacifico - Preston families complex, 2 to 30 percent slopes

Elevation: 4,800 to 7,500 feet Annual Precipitation: 20 to 35 inches

Soil Map Unit Components	**Pacifico family**	**Preston family**
Approximate Proportion	45 percent	35 percent
Landscape Position	Hillsides	Hillsides
Slope	2 to 30 percent	2 to 30 percent
Typical Vegetation Series	Ponderosa/Jeffrey pine, Coulter pine, canyon live oak, or black oak	Ponderosa/Jeffrey pine, Coulter pine, black oak, or canyon live oak

Soil Profile Description

Surface Layer	0 to 3 inches; grayish brown loamy coarse sand; weak granular structure; soft; pH 6.5	0 to 4 inches; grayish brown loamy sand; weak granular structure; soft; pH 6.7
Subsoil	3 to 15 inches; light yellowish brown loamy coarse sand; massive; soft; pH 6.5	4 to 19 inches; light yellowish brown loamy sand; massive; soft; pH 6.7
Substratum	15 inches; highly weathered granodiorite	19 to 28 inches; pale yellow gravelly loamy sand; massive; soft; pH 6.7 28 inches; highly weathered granite

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	20 to 50
Available Water Capacity	Very low	Very low
Water Retention Class	3	2
Hydrologic Soil Group	C	B
Permeability	Rapid	Rapid
Maximum Erosion Hazard	Moderate or high	Moderate
Erosion Factor K	.17	.14
Drainage Class	Somewhat excessively drained	Somewhat excessively drained
Soil Manageability		
Group	II	II
Class	2Ped-2PEd	2ep
Soil Productivity	Low	Low
Forage Production Class	3	4
Forest Survey Site Class	6	5
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of soils of the Oak Glen family on alluvial fans (Fawnskin Valley, Cienega Seca, Big Pine Flats), Rock outcrop, soils that are similar to the soils in this unit but have a deep dark surface layer, and soils at elevations above 7,500 feet that have mean annual soil temperatures of less than 47 degrees F. Included areas make up 20 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

DdF—Pacifico - Preston families complex, 30 to 50 percent slopes

Elevation: 4,800 to 7,500 feet Annual Precipitation: 20 to 35 inches

Soil Map Unit Components	**Pacifico family**	**Preston family**
Approximate Proportion	40 percent	35 percent
Landscape Position	Mountainsides	Mountainsides
Slope	30 to 50 percent	30 to 50 percent
Typical Vegetation Series	Ponderosa/Jeffrey pine, Coulter pine, or canyon live oak	Coulter pine or ponderosa/Jeffrey pine

Soil Profile Description

Surface Layer	0 to 3 inches; grayish brown loamy coarse sand; weak granular structure; soft; pH 6.5	0 to 4 inches; grayish brown loamy sand; weak granular structure; soft; pH 6.7
Subsoil	3 to 15 inches; light yellowish brown loamy coarse sand; massive; soft; pH 6.5	4 to 19 inches; light yellowish brown loamy sand; massive; soft; pH 6.7
Substratum	15 inches; highly weathered granodiorite	19 to 28 inches; pale yellow gravelly loamy sand; massive; soft; pH 6.7 28 inches; highly weathered granite

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	20 to 50
Available Water Capacity	Very low	Very low
Water Retention Class	3	2
Hydrologic Soil Group	C	B
Permeability	Rapid	Rapid
Maximum Erosion Hazard	High	High
Erosion Factor K	.17	.14
Drainage Class	Somewhat excessively drained	Somewhat excessively drained
Soil Manageability		
Group	III	III
Class	3EPdg	3Egp
Soil Productivity	Low	Low
Forage Production Class	3	4
Forest Survey Site Class	6	5
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of soils of the Springdale and Wapi families and Rock outcrop. Included areas make up 25 percent of the unit.

DeF—Tyee - Tollhouse families complex, 30 to 50 percent slopes

Elevation: 3,400 to 5,600 feet Annual Precipitation: 15 to 25 inches

Soil Map Unit Components	**Tyee family**	**Tollhouse family**
Approximate Proportion	45 percent	35 percent
Landscape Position	Mountainsides	Mountainsides
Slope	30 to 50 percent	30 to 50 percent
Typical Vegetation Series	Ceanothus, manzanita, or chamise	Ceanothus, manzanita, or chamise

Soil Profile Description

Surface Layer	0 to 4 inches; dark brown gravelly sandy loam; weak subangular blocky structure; soft; pH 7.0	0 to 11 inches; very dark grayish brown gravelly sandy loam; weak granular structure; soft; pH 7.0
Subsoil	4 to 11 inches; light yellowish brown sandy loam; massive; soft; pH 7.0	11 to 18 inches; dark grayish brown sandy loam; massive; soft; pH 7.0
Substratum	11 to 15 inches; light yellowish brown coarse sandy loam; massive; soft; pH 6.5 15 inches; highly weathered granite	18 inches; highly weathered granite

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	2	2
Hydrologic Soil Group	C	C
Permeability	Moderately rapid	Moderately rapid
Maximum Erosion Hazard	Very high	Very high
Erosion Factor K	.21	.14
Drainage Class	Somewhat excessively drained	Somewhat excessively drained
Soil Manageability Group Class	 III 3Epdg	 III 3Epdg
Soil Productivity	Low	Low
Forage Production Class	3	3
Forest Survey Site Class	NC	NC
Chaparral Class	2	3
Included Areas and Remarks:	Included in this unit are areas of Rock outcrop and soils of Pacifico family, dry and Wapi family, dry. Included areas make up 20 percent of the unit.	

DhG—Lithic Xerorthents-Springdale family-Rubble land association, 50 to 100 percent slopes

Elevation: 4,000 to 7,500 feet Annual Precipitation: 20 to 35 inches

Soil Map Unit Components	**Lithic Xerorthents**	**Springdale family**	**Rubble land**
Approximate Proportion	35 percent	20 percent	15 percent
Landscape Position	Mountainsides	Drainageways or colluvial areas of mountainsides	Colluvial areas of mountainsides
Slope	60 to 90 percent	50 to 70 percent	50 to 100 percent
Typical Vegetation Series	Coulter pine or canyon live oak	Coulter pine or ponderosa/Jeffrey pine	Barren

Soil Profile Description

Surface Layer	Depth to hard rock is 10 to 20 inches. The profile is loam, sandy loam, or loamy sand and is 35 to 80 percent rock fragments. Mean annual soil temperature is 47 to 54 degrees F.	0 to 7 inches; brown very gravelly loamy sand; single grain; loose; pH 7.0	Rubble land consists of detached rock fragments that have accumulated on very steep to extremely steep mountainsides as talus shoots. These areas support little or no vegetation and are subject to frequent landslides.
Subsoil		7 to 30 inches; yellowish brown and brownish yellow extremely gravelly loamy sand; single grain; loose; pH 6.5	
Substratum		30 inches; highly fractured granodiorite	

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	20 to 50
Available Water Capacity	Very low	Very low
Water Retention Class	3	3
Hydrologic Soil Group	C	B
Permeability	Moderately rapid to very rapid	Very rapid
Maximum Erosion Hazard	High or very high	High
Erosion Factor K		.09
Drainage Class	Somewhat excessively drained to excessively drained	Somewhat excessively drained
Soil Manageability		
Group	IV	IV
Class	4EPGd	4EPG
Soil Productivity	Low	Low
Forage Production Class	NC	NC
Forest Survey Site Class	7	6
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of Rock outcrop, soils of the Winthrop family, and the dry phases of the soils in this unit. Included areas make up 30 percent of the unit. The soils in this unit have a high potential for movement due to dry ravel if the protective cover is removed.

DnE—Trigo family - Lithic Xerorthents, warm complex, 15 to 30 percent slopes

Elevation: 3,000 to 5,000 feet Annual Precipitation: 10 to 20 inches

Soil Map Unit Components	**Trigo family**	**Lithic Xerorthents, warm**
Approximate Proportion	50 percent	20 percent
Landscape Position	Hillsides	Hillsides
Slope	15 to 30 percent	15 to 30 percent
Typical Vegetation Series	Chamise, manzanita, juniper-scrub oak-pinyon, ceanothus, or interior live oak	Chamise, manzanita, juniper-scrub oak-pinyon, ceanothus, or interior live oak

Soil Profile Description

Surface Layer	0 to 3 inches; yellowish brown coarse sandy loam; weak granular structure; soft; pH 6.5	Depth to hard rock is 10 to 20 inches. The profile is loam or sandy loam and is 5 to 70 percent rock fragments, or it is loamy sand and is 35 to 80 percent rock fragments. Mean annual soil temperature is 59 to 70 degrees F.
Subsoil	3 to 12 inches; yellowish brown coarse sandy loam; massive; hard; pH 6.5	
Substratum	12 inches; highly weathered granite	

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	3	3
Hydrologic Soil Group	C	C
Permeability	Moderately rapid	Moderately rapid to very rapid
Maximum Erosion Hazard	High	High
Erosion Factor K	.21	
Drainage Class	Somewhat excessively drained	Somewhat excessively drained to excessively drained
Soil Manageability		
Group	II	II
Class	2EPd	2EPd
Soil Productivity	Very low	Very low
Forage Production Class	1 or 2	1 or 2
Forest Survey Site Class	NC	NC
Chaparral Class	2	2 to 3

Included Areas and Remarks: Included in this unit are areas of soils of the Osito family, soils that are loamy sand throughout the soil profile and are in areas with 15 to 25 percent Rock outcrop (Red Mountain area), and soils that have slopes of 5 to 15 percent (Pinyon Flat). Included areas make up 30 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

DnF—Trigo family - Lithic Xerorthents, warm complex, 30 to 50 percent slopes

Elevation: 1,800 to 6,400 feet Annual Precipitation: 10 to 20 inches

Soil Map Unit Components	**Trigo family**	**Lithic Xerorthents, warm**
Approximate Proportion	60 percent	15 percent
Landscape Position	Mountainsides	Mountainsides
Slope	30 to 50 percent	30 to 50 percent
Typical Vegetation Series	Chamise, ceanothus, interior live oak, manzanita, or juniper-scrub oak-pinyon pine	Chamise, ceanothus, interior live oak, manzanita, or juniper-scrub oak-pinyon pine

Soil Profile Description

Surface Layer	0 to 3 inches; yellowish brown coarse sandy loam; weak granular structure; soft; pH 6.5	Depth to hard rock is 10 to 20 inches. The profile is loam or sandy loam and is 5 to 70 percent rock fragments, or it is loamy sand with 35 to 80 percent rock fragments. Mean annual soil temperature is 59 to 70 degrees F.
Subsoil	3 to 12 inches; yellowish brown coarse sandy loam; massive; hard; pH 6.5	
Substratum	12 inches; highly weathered granite	

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	3	3
Hydrologic Soil Group	C	C
Permeability	Moderately rapid	Moderately rapid to very rapid
Maximum Erosion Hazard	Very high	Very high
Erosion Factor K	.21	
Drainage Class	Somewhat excessively drained	Somewhat excessively drained to excessively drained
Soil Manageability		
Group	III	III
Class	3EPdg	3EPdg
Soil Productivity	Very low	Very low
Forage Production Class	1 or 2	1 or 2
Forest Survey Site Class	NC	NC
Chaparral Class	2	2 to 3

Included Areas and Remarks: Included in this unit are areas of soils of the San Andreas family, Rock outcrop, soils that are similar to the soils in this unit but are loamy sand or sand throughout the soil profile, soils of the Springdale family, dry in colluvial areas (supporting bigcone Douglas-fir and canyon live oak), and soils of the Ramona family on old terraces that have slopes of 5 to 20 percent. There are also small areas of shallow soils that formed in material derived from fine-grained sandstone and have very fine sandy loam textures throughout the soil profile. Included areas make up 25 percent of the unit.

DnG—Trigo family - Lithic Xerorthents, warm complex, 50 to 75 percent slopes

Elevation: 1,800 to 6,400 feet Annual Precipitation: 10 to 20 inches

Soil Map Unit Components	**Trigo family**	**Lithic Xerorthents, warm**
Approximate Proportion	50 percent	20 percent
Landscape Position	Mountainsides	Mountainsides
Slope	50 to 75 percent	50 to 75 percent
Typical Vegetation Series	Chamise, ceanothus, manzanita, interior live oak, or juniper-scrub oak-pinyon	Chamise, ceanothus, manzanita, interior live oak, or juniper-scrub oak-pinyon

Soil Profile Description

Surface Layer	0 to 3 inches; yellowish brown coarse sandy loam; weak granular structure; soft; pH 6.5	Depth to hard rock is 10 to 20 inches. The profile is loam or sandy loam and is 5 to 70 percent rock fragments, or it is loamy sand and is 35 to 80 percent rock fragments. Mean annual soil temperature is 59 to 70 degrees F.
Subsoil	3 to 12 inches; yellowish brown coarse sandy loam; massive; hard; pH 6.5	
Substratum	12 inches; highly weathered granite	

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	3	3
Hydrologic Soil Group	C	C
Permeability	Moderately rapid	Moderately rapid to very rapid
Maximum Erosion Hazard	Very high	Very high
Erosion Factor K	.21	
Drainage Class	Somewhat excessively drained	Somewhat excessively drained to excessively drained
Soil Manageability		
Group	IV	IV
Class	4EPGd	4EPGd
Soil Productivity	Very low	Very low
Forage Production Class	NC	NC
Forest Survey Site Class	NC	NC
Chaparral Class	2	2-3

Included Areas and Remarks: Included in this unit are areas of Rock outcrop, soils of the Ramona family on old terraces and soils of the Springdale family, dry in colluvial areas (supporting bigcone Douglas-fir and canyon live oak). There are also small areas with shallow soils that formed in material weathered from fine-grained sandstone with very fine sandy loam textures throughout the soil profile. Included areas make up 30 percent of the unit. Elevations above 5,000 feet are confined to desert slopes. These soils have a high potential for movement due to dry ravel if the protective cover is removed.

DpF—Lithic Xerorthents, warm - Rock outcrop complex, 30 to 50 percent slopes

Elevation: 2,000 to 6,400 feet Annual Precipitation: 10 to 20 inches

Soil Map Unit Components	**Lithic Xerorthents, warm**	**Rock outcrop**
Approximate Proportion	50 percent	25 percent
Landscape Position	Mountainsides	Mountainsides
Slope	30 to 50 percent	30 to 50 percent
Typical Vegetation Series	Chamise, ceanothus, manzanita, interior live oak, or juniper-scrub oak-pinyon pine	Barren

Soil Profile Description

Surface Layer	Depth to hard rock is 10 to 20 inches. The profile is loam or sandy loam and is 5 to 70 percent rock fragments, or it is loamy sand and is 35 to 80 percent rock fragments. Mean annual soil temperature is 59 to 70 degrees F.	Rock outcrop consists of exposed bedrock with less than 15 percent included areas of soil material capable of supporting vegetation
Subsoil		
Substratum		

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20
Available Water Capacity	Very low
Water Retention Class	3
Hydrologic Soil Group	C
Permeability	Moderately rapid to very rapid
Maximum Erosion Hazard	High or very high
Erosion Factor K	
Drainage Class	Somewhat excessively drained to excessively drained
Soil Manageability	
Group	III
Class	3EPdg
Soil Productivity	Very low
Forage Production Class	1 or 2
Forest Survey Site Class	NC
Chaparral Class	2 to 3
Included Areas and Remarks:	Included in this unit are areas of soils of the Trigo family and soils that are loamy sand or sand throughout the soil profile. Included areas make up 25 percent of the unit. Elevations above 5,000 feet are confined to desert slopes.

DpG—Lithic Xerorthents, warm - Rock outcrop complex, 50 to 100 percent slopes

Elevation: 2,000 to 6,800 feet Annual Precipitation: 10 to 20 inches

Soil Map Unit Components	**Lithic Xerorthents, warm**	**Rock outcrop**
Approximate Proportion	50 percent	30 percent
Landscape Position	Mountainsides	Mountainsides
Slope	50 to 80 percent	50 to 100 percent
Typical Vegetation Series	Chamise, ceanothus, manzanita, interior live oak, or juniper-scrub oak-pinyon pine	Barren

Soil Profile Description

Surface Layer	Depth to hard rock is 10 to 20 inches. The profile is loam or sandy loam and is 5 to 70 percent rock fragments, or it is loamy sand and is 35 to 80 percent rock fragments. Mean annual soil temperature is 59 to 70 degrees F.	Rock outcrop consists of exposed bedrock with less than 15 percent included areas of soil material capable of supporting vegetation
Subsoil		
Substratum		

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20
Available Water Capacity	Very low
Water Retention Class	3
Hydrologic Soil Group	C
Permeability	Moderately rapid to very rapid
Maximum Erosion Hazard	Very high
Erosion Factor K	
Drainage Class	Somewhat excessively drained to excessively drained
Soil Manageability	
Group	IV
Class	4EPGd
Soil Productivity	Very low
Forage Production Class	NC
Forest Survey Site Class	NC
Chaparral Class	2-3
Included Areas and Remarks:	Included in this unit are areas of soils of the Trigo family and soils which are loamy sand or sand throughout the soil profile. Included areas make up 20 percent of the unit. Elevations above 5,000 feet are confined to desert slopes. Lithic Xerorthents, warm soil has a high potential for movement due to dry ravel if the protective cover is removed.

DxE—Wapi-Pacifico families, dry - Rock outcrop complex, 15 to 30 percent slopes

Elevation: 3,600 to 7,000 feet Annual Precipitation: 10 to 20 inches

Soil Map Unit Components	**Wapi family, dry**	**Pacifico family, dry**	**Rock outcrop**
Approximate Proportion	40 percent	30 percent	20 percent
Landscape Position	Hillsides	Hillsides	Hillsides
Slope	15 to 30 percent	15 to 30 percent	15 to 30 percent
Typical Vegetation Series	Ceanothus, manzanita, chamise, interior live oak, or juniper-scrub oak-pinyon pine	Ceanothus, manzanita, chamise, interior live oak, or juniper-scrub oak-pinyon pine	Barren

Soil Profile Description

Surface Layer	0 to 2 inches; grayish brown gravelly loamy sand; massive; soft; pH 6.5	0 to 2 inches; grayish brown gravelly loamy sand; weak granular structure; loose; pH 7.0	Rock outcrop consists of exposed bedrock with less than 15 percent included areas of soil material capable of supporting vegetation.
Subsoil	2 to 13 inches; pale brown gravelly loamy sand; massive; soft; pH 6.5	2 to 12 inches; light yellowish brown loamy sand; massive; loose; pH 6.8	
Substratum	13 to 15 inches; highly weathered granite 15 inches; hard fractured granite	12 inches; highly weathered granite	

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	3	3
Hydrologic Soil Group	C	C
Permeability	Rapid	Rapid
Maximum Erosion Hazard	High	High
Erosion Factor K	.14	.14
Drainage Class	Somewhat excessively drained	Somewhat excessively drained
Soil Manageability		
Group	II	II
Class	2EPd	2EPd
Soil Productivity	Very low	Very low
Forage Production Class	1	1
Forest Survey Site Class	NC	NC
Chaparral Class	2	2

Included Areas and Remarks:

Included in this unit are areas of soils that are similar to those of the Preston family, soils of the Avawatz family in drainageways of the Soboba burn area (supporting sycamore and coastal live oak), soils of the Goulding and Olete families as described in map unit FaE (Butler Peak Quad only), soils at elevations above 7,800 feet that have a mean annual soil temperature of less than 47 degrees F. (supporting pinyon pine and juniper), and soils that receive 20 to 30 inches precipitation annually on south to west aspects. Included areas make up 10 percent of the unit. Chamise is present only in borderline thermic/mesic soil temperature regimes. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

DxF—Wapi - Pacifico families, dry - Rock outcrop complex, 30 to 50 percent slopes

Elevation: 3,600 to 7,800 feet Annual Precipitation: 10 to 20 inches

Soil Map Unit Components	**Wapi family, dry**	**Pacifico family, dry**	**Rock outcrop**
Approximate Proportion	30 percent	25 percent	20 percent
Landscape Position	Mountainsides	Mountainsides	Mountainsides
Slope	30 to 50 percent	30 to 50 percent	30 to 50 percent
Typical Vegetation Series	Ceanothus, manzanita, chamise, interior live oak, or juniper-scrub oak-pinyon pine	Ceanothus, manzanita, chamise, interior live oak, or juniper-scrub oak-pinyon pine	Barren

Soil Profile Description

Surface Layer	0 to 2 inches; grayish brown gravelly loamy sand; massive; soft; pH 6.5	0 to 2 inches; grayish brown gravelly loamy sand; weak granular structure; loose; pH 7.0	Rock outcrop consists of exposed bedrock with less than 15 percent included areas of soil material capable of supporting vegetation.
Subsoil	2 to 13 inches; pale brown gravelly loamy sand; massive; soft; pH 6.5	2 to 12 inches; light yellowish brown loamy sand; massive; loose; pH 6.8	
Substratum	13 to 15 inches; highly weathered granite 15 inches; hard fractured granite	12 inches; highly weathered granite	

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	3	3
Hydrologic Soil Group	C	C
Permeability	Rapid	Rapid
Maximum Erosion Hazard	High	High
Erosion Factor K	.14	.14
Drainage Class	Somewhat excessively drained	Somewhat excessively drained
Soil Manageability		
Group	III	III
Class	3EPdg	3EPdg
Soil Productivity	Very low	Very low
Forage Production Class	1	1
Forest Survey Site Class	NC	NC
Chaparral Class	2	2

Included Areas and Remarks: Included in this unit are areas of soils of the Goulding and Olete families as described in map unit FaF (Butler Peak Quad only), soils that are similar to those of the Preston family, soils above 7,800 feet that have a mean annual soil temperature less than 47 degrees F. (supporting pinyon pine and juniper), and soils that receive 20 to 30 inches precipitation annually on south to west aspects. Included areas make up 25 percent of the unit. Chamise is present only in borderline thermic/mesic soil temperature regimes.

DxG—Wapi - Pacifico families, dry - Rock outcrop complex, 50 to 75 percent slopes

Elevation: 3,600 to 7,800 feet Annual Precipitation: 10 to 20 inches

Soil Map Unit Components	**Wapi family, dry**	**Pacifico family, dry**	**Rock outcrop**
Approximate Proportion	30 percent	25 percent	25 percent
Landscape Position	Mountainsides	Mountainsides	Mountainsides
Slope	50 to 75 percent	50 to 75 percent	50 to 75 percent
Typical Vegetation Series	Ceanothus, manzanita, chamise, juniper-scrub oak, pinyon pine, or interior live oak	Ceanothus, manzanita, chamise, juniper-scrub oak, pinyon pine, or interior live oak	Barren

Soil Profile Description

Surface Layer	0 to 2 inches; grayish brown gravelly loamy sand; massive; soft; pH 6.5	0 to 2 inches; grayish brown gravelly loamy sand; weak granular structure; loose; pH 7.0	Rock outcrop consists of exposed bedrock with less than 15 percent included areas of soil material capable of supporting vegetation.
Subsoil	2 to 13 inches; pale brown gravelly loamy sand; massive; soft; pH 6.5	2 to 12 inches; light yellowish brown loamy sand; massive; loose; pH 6.8	
Substratum	13 to 15 inches; highly weathered granite 15 inches; hard fractured granite	12 inches; highly weathered granite	

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	3	3
Hydrologic Soil Group	C	C
Permeability	Rapid	Rapid
Maximum Erosion Hazard	Very high	Very high
Erosion Factor K	.14	.14
Drainage Class	Somewhat excessively drained	Somewhat excessively drained
Soil Manageability		
Group	IV	IV
Class	4EPGd	4EPGd
Soil Productivity	Very low	Very low
Forage Production Class	NC	NC
Forest Survey Site Class	NC	NC
Chaparral Class	2	2

Included Areas and Remarks: Included in this unit are areas of soils of the Springdale family, dry in colluvial areas, soils of the Preston family (supporting canyon live oak or Coulter pine), soils above 7,800 feet that have a mean annual soil temperature of less than 47 degrees F (supporting pinyon pine and juniper), and soils that receive 20 to 30 inches precipitation annually on south to west aspects. Included areas make up 20 percent of the unit. Chamise is present only in borderline thermic/mesic soil temperature regimes. The soils in this unit have a high potential for movement due to dry ravel if the protective cover is removed.

EsD—Riverwash - Soboba family association, 2 to 15 percent slopes

Elevation: 1,600 to 4,000 feet Annual Precipitation: 15 to 25 inches

Soil Map Unit Components	**Riverwash**	**Soboba family**
Approximate Proportion	50 percent	30 percent
Landscape Position	Drainageways	Stabilized flood plains adjacent to active drainageways
Slope	2 to 10 percent	5 to 15 percent
Typical Vegetation Series	Barren	Chamise, ceanothus, or manzanita (sycamore or cottonwood in riparian zones)

Soil Profile Description

Surface Layer	Riverwash consists of unstabilized sandy, gravelly, cobbly, and stony material that is flooded, washed, and reworked by rivers so frequently that it supports little or no vegetation.	0 to 8 inches; brown and light olive brown very cobbly gravelly loamy sand and sand; massive; soft; pH 7.2
Subsoil		8 to 24 inches; grayish brown very cobbly sand; single grain; loose; pH 7.0
Substratum		24 to 60 inches; stratified yellowish brown very cobbly loamy fine sand and sand; single grain; loose; pH 7.0 60 inches; mixed alluvium

Soil Properties & Management Interpretations

Effective Rooting Depth	60
Available Water Capacity	Very low
Water Retention Class	3
Hydrologic Soil Group	A
Permeability	Very rapid
Maximum Erosion Hazard	Moderate
Erosion Factor K	.08
Drainage Class	Excessively drained
Soil Manageability Group Class	 II 2Pe
Soil Productivity	Very low
Forage Production Class	2
Forest Survey Site Class	NC
Chaparral Class	2

Included Areas and Remarks: Included in this unit are areas of soils of the Hanford family on fans and soils that are similar to those of the Soboba family but are less than 35 percent rock fragments throughout the soil profile. Included areas make up 20 percent of the unit. Erosion on the Soboba soil can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

FaE—Olete - Goulding families association, 15 to 30 percent slopes

Elevation: 5,000 to 8,000 feet Annual Precipitation: 15 to 30 inches

Soil Map Unit Components	**Olete family**	**Goulding family**
Approximate Proportion	50 percent	25 percent
Landscape Position	Hillsides that have mainly north to east aspects	Hillsides that have mainly south to west aspects
Slope	15 to 30 percent	15 to 30 percent
Typical Vegetation Series	Pinyon pine, juniper, or Coulter pine	Pinyon pine or juniper

Soil Profile Description

Surface Layer	0 to 3 inches; dark brown very cobbly fine sandy loam; massive; soft; pH 7.3	0 to 3 inches; brown gravelly sandy loam; weak granular structure; slightly hard; pH 7.0
Subsoil	3 to 26 inches; yellowish brown very cobbly loam; weak subangular blocky structure; slightly hard; pH 7.0	3 to 12 inches; yellowish brown very gravelly loam; weak subangular blocky structure; hard; pH 6.5
Substratum	26 inches; highly fractured gneiss	12 inches; hard, slightly weathered gneiss

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 40	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	2	3
Hydrologic Soil Group	B	C
Permeability	Moderate	Moderately rapid
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.17	.16
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	II	II
Class	2ep	2Ped
Soil Productivity	Low	Low
Forage Production Class	3	2
Forest Survey Site Class	6 or 7	7
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of Rock outcrop, soils of the Kilburn family asociated with the Olete family, soils of the Hodgson family on old terrace remnants, and soils of the Pacifico family, dry. Included areas make up 25 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

FaF—Olete - Goulding families association, 30 to 50 percent slopes

Elevation: 5,000 to 8,000 feet Annual Precipitation: 15 to 30 inches

Soil Map Unit Components	**Olete family**	**Goulding family**
Approximate Proportion	50 percent	25 percent
Landscape Position	Mountainsides (mainly on the east to north aspects but also on the foot slopes of all aspects)	Mountainsides (mainly on the south to west aspects but also on the upper slopes of all aspects)
Slope	30 to 50 percent	30 to 50 percent
Typical Vegetation Series	Pinyon pine, Coulter pine, or juniper	Pinyon pine or juniper

Soil Profile Description

Surface Layer	0 to 3 inches; dark brown very cobbly fine sandy loam; massive; soft; pH 7.3	0 to 3 inches; brown gravelly sandy loam; weak granular structure; slightly hard; pH 7.0
Subsoil	3 to 26 inches; yellowish brown very cobbly loam; weak subangular blocky structure; slightly hard; pH 7.0	3 to 12 inches; yellowish brown very gravelly loam; weak subangular blocky structure; hard; pH 6.5
Substratum	26 inches; highly fractured gneiss	12 inches; hard, slightly weathered gneiss

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 40	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	2	3
Hydrologic Soil Group	B	C
Permeability	Moderate	Moderately rapid
Maximum Erosion Hazard	High	High
Erosion Factor K	.17	.16
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	III	III
Class	3Epg	3EPdg
Soil Productivity	Low	Low
Forage Production Class	3	2
Forest Survey Site Class	6 or 7	7
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of Rock outcrop, soils of the Kilburn family associated with the Olete family, soils that are similar to those of the Olete and Goulding families but that have less than 35 percent rock fragments throughout the soil profile, soils of the Pacifico family, dry, and soils above 8,000 feet that have a mean annual soil temperature less than 47 degrees F. (supporting Jeffrey pine and white fir). Included areas make up 25 percent of the unit. Areas above 7,000 feet are on south- to west-facing slopes.

FbE—Merkel - Switchback families complex, 15 to 30 percent slopes

Elevation: 7,000 to 9,000 feet Annual Precipitation: 25 to 40 inches

Soil Map Unit Components	**Merkel family**	**Switchback family**
Approximate Proportion	40 percent	30 percent
Landscape Position	Slightly convex areas of hills	Slightly convex areas of hills
Slope	15 to 30 percent	15 to 30 percent
Typical Vegetation Series	Jeffrey pine, white fir, or lodgepole pine	Jeffrey pine, white fir, or lodgepole pine

Soil Profile Description

Surface Layer	0 to 3 inches; dark brown very gravelly loam; weak granular structure; soft pH 7.0	0 to 5 inches; brown sandy loam; weak granular structure; slightly hard; pH 7.0
Subsoil	3 to 18 inches; light yellowish brown very gravelly loam; moderate subangular blocky structure; soft; pH 6.5	5 to 24 inches; light yellowish brown sandy loam; moderate subangular blocky structure; slightly hard; pH 6.5
Substratum	18 to 30 inches; light yellowish brown very gravelly loam; massive; slightly hard; pH 6.8 30 inches; hard, slightly weathered fractured gneiss	24 to 30 inches; yellowish brown coarse sandy loam; massive; slightly hard; pH 7.0 30 inches; highly weathered diorite

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 40	20 to 40
Available Water Capacity	Low	Low
Water Retention Class	2	2
Hydrologic Soil Group	B	B
Permeability	Moderate	Moderately rapid
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.18	.21
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	II	II
Class	2ep	2ep
Soil Productivity	Low	Moderate
Forage Production Class	4	5
Forest Survey Site Class	5	4
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of soils of the Goulding family (supporting pinyon pine) on south to west aspects, soils of the Corbett and Wapal families, soils in drainageways that are similar to those of the Avawatz family but have a mean annual soil temperature of less than 47 degrees F., and Lithic Xerorthents, cool. Included areas make up 30 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

FbF—Merkel - Wapal families complex, 30 to 50 percent slopes

Elevation: 7,000 to 9,000 feet Annual Precipitation: 25 to 40 inches

Soil Map Unit Components	**Merkel family**	**Wapal family**
Approximate Proportion	50 percent	20 percent
Landscape Position	Mountainsides	Mountainsides
Slope	30 to 50 percent	30 to 50 percent
Typical Vegetation Series	Jeffrey pine, white fir, or lodgepole pine	Jeffrey pine, white fir, or lodgepole pine

Soil Profile Description

Surface Layer	0 to 3 inches; dark brown very gravelly loam; weak granular structure; soft; pH 7.0	0 to 3 inches; light olive brown very gravelly sandy loam; weak granular structure; soft; pH 6.4
Subsoil	3 to 18 inches; light yellowish brown very gravelly loam; moderate subangular blocky structure; soft; pH 6.5	3 to 27 inches; light yellowish brown very gravelly loamy sand; single grain; loose; pH 6.2
Substratum	18 to 30 inches; yellowish brown very gravelly loam; massive; slightly hard; pH 6.8 30 inches; hard, slightly weathered fractured gneiss	27 to 40 inches; light yellowish brown extremely gravelly loamy sand; single grain; loose; pH 6.3 40 inches; highly fractured granite

Soil Properties & Management Interpretations

Effective Rooting Depth	20 TO 40	20 to 60
Available Water Capacity	Low	Very low
Water Retention Class	2	3
Hydrologic Soil Group	B	B
Permeability	Moderate	Very rapid
Maximum Erosion Hazard	High	High
Erosion Factor K	.18	.10
Drainage Class	Well drained	Somewhat excessively drained
Soil Manageability		
Group	III	III
Class	3Epg	3EPg
Soil Productivity	Low	Low
Forage Production Class	4	3
Forest Survey Site Class	5	6
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of soils of the Switchback and Corbett families, Lithic Xerorthents, cool, and Rock outcrop. Included areas make up 30 percent of the unit.

FhG—Springdale - Winthrop families complex, 50 to 75 percent slopes

Elevation: 4,000 to 7,000 feet Annual Precipitation: 20 to 35 inches

Soil Map Unit Components	**Springdale family**	**Winthrop family**
Approximate Proportion	40 percent	30 percent
Landscape Position	Mountainsides	Mountainsides
Slope	50 to 75 percent	50 to 75 percent
Typical Vegetation Series	Ponderosa/Jeffrey pine or Coulter pine	Ponderosa/Jeffrey pine or Coulter pine

Soil Profile Description

Surface Layer	0 to 7 inches; brown very gravelly loamy sand; single grain; loose; pH 7.0	0 to 10 inches; brown very gravelly loamy coarse sand; single grain; loose; pH 6.5
Subsoil	7 to 30 inches; yellowish brown and brownish yellow extremely gravelly loamy sand; single grain; loose; pH 6.5	10 to 26 inches; yellowish brown very gravelly loamy coarse sand; massive; soft; pH 6.5
Substratum	30 inches; highly fractured granodiorite	26 inches; highly weathered granite

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 50	20 to 40
Available Water Capacity	Very low	Very low
Water Retention Class	3	3
Hydrologic Soil Group	B	B
Permeability	Very rapid	Very rapid
Maximum Erosion Hazard	High	High
Erosion Factor K	.09	.07
Drainage Class	Somewhat excessively drained	Somewhat excessively drained
Soil Manageability		
Group	IV	IV
Class	4EPG	4EPG
Soil Productivity	Low	Low
Forage Production Class	NC	NC
Forest Survey Site Class	6	6
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of Lithic Xerorthents, Rock outcrop, soils of the Springdale family, dry and Lithic Xerorthents, dry. Included areas make up 30 percent of the unit. The soils in this unit have a high potential for movement due to dry ravel if the protective cover is removed.

FLG—Springdale family - Lithic Xerorthents association, dry, 50 to 75 percent slopes

Elevation: 3,000 to 7,000 feet Annual Precipitation: 15 to 25 inches

Soil Map Unit Components	**Springdale family, dry**	**Lithic Xerorthents, dry**
Approximate Proportion	40 Percent	35 Percent
Landscape Position	North to east aspects of foot slopes and colluvial areas on mountainsides	South to west aspects or narrow ridges and upper side slopes of mountainsides
Slope	50 to 70 percent	60 to 75 percent
Typical Vegetation Series	Bigcone Douglas-fir or canyon live oak	Ceanothus, manzanita, or interior live oak

Soil Profile Description

Surface Layer	0 to 5 inches; brown gravelly loamy coarse sand; weak granular structure; soft; pH 7.3	Depth to hard rock is 10 to 20 inches. The profile is loam, sandy loam, or loamy sand and is 35 to 80 percent rock fragments. Mean annual soil temperature is 54 to 59 degrees F.
Subsoil	5 to 25 inches; pale brown very gravelly loamy sand; single grain; loose; pH 7.0	
Substratum	25 to 45 inches; very pale brown very gravelly coarse sand; single grain; loose; pH 7.0 45 inches; slightly weathered fractured granite	

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 50	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	3	3
Hydrologic Soil Group	B	C
Permeability	Very rapid	Moderately rapid to very rapid
Maximum Erosion Hazard	High	Very high
Erosion Factor K	.14	
Drainage Class	Somewhat excessively drained	Somewhat excessively drained to excessively drained
Soil Manageability		
Group	IV	IV
Class	4EPG	4EPGXd
Soil Productivity	Very low	Very low
Forage Production Class	NC	NC
Forest Survey Site Class	NC	NC
Chaparral Class	3	2

Included Areas and Remarks: Included in this unit are areas of Rock outcrop {associated with Lithic Xerorthents, dry), soils of the Tyee and Pacifico, dry, families, and soils that are similar to those in this map unit but support Coulter pine. Included areas make up 25 percent of the unit. The soils in this unit have a high potential for movement due to dry ravel if the protective cover is removed.

FrE—Lizzant family - Lithic Xerorthents, calcareous association, 15 to 30 percent slopes

Elevation: 6,500 to 8,000 feet Annual Precipitation: 20 to 30 inches

Soil Map Unit Components	**Lizzant family**	**Lithic Xerorthents, calcareous**
Approximate Proportion	50 percent	25 percent
Landscape Position	Broad ridges and north to east aspects of hills	Upper side slopes and narrow ridges or south to west aspects of hills
Slope	15 to 30 percent	15 to 30 percent
Typical Vegetation Series	Pinyon pine or juniper	Pinyon pine or juniper

Soil Profile Description

Surface Layer	0 to 11 inches; brown very cobbly fine sandy loam; weak granular structure; soft; slightly effervescent; pH 8.0	Depth to hard limestone is 10 to 20 inches. The profile is loam or sandy loam and is 5 to 50 percent rock fragments; pH is 7.9 to 9.0. The profile below 4 inches is strongly to violently effervescent. Mean annual soil temperature is 47 to 63 degrees F.
Subsoil	11 to 24 inches; light yellowish brown very cobbly fine sandy loam; massive; soft; slightly effervescent; pH 8.0	
Substratum	24 to 46 inches; yellow very cobbly sandy loam; massive; soft; strongly effervescent; pH 8.0 46 inches; hard, fractured limestone	

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 45	10 to 20
Available Water Capacity	Low	Very low
Water Retention Class	2	3
Hydrologic Soil Group	B	C
Permeability	Moderate	Moderately rapid to very rapid
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.16	
Drainage Class	Well drained	Somewhat excessively drained to excessively drained
Soil Manageability		
Group	II	II
Class	2ep	2PXed
Soil Productivity	Low	Very low
Forage Production Class	3	2-3
Forest Survey Site Class	7	7
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of Rock outcrop (associated with Lithic Xerorthents, calcareous) and soils that are similar to those of the Lizzant family but are less than 35 percent rock fragments throughout the soil profile or have mean annual soil temperature of more than 47 degrees F (elevations below 6,500 feet) or both. Included areas make up 25 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant cover at or near the surface will help improve available water capacity.

FrF—Lithic Xerorthents, calcareous - Lizzant family association, 30 to 50 percent slopes

Elevation: 6,500 to 8,000 feet Annual Precipitation: 20 to 30 inches

Soil Map Unit Components	**Lithic Xerorthents, calcareous**	**Lizzant family**
Approximate Proportion	45 percent	30 percent
Landscape Position	Narrow ridges, on south to west aspects and on upper slopes of mountainsides	Broad ridges, on north to east aspects and on foot slopes of mountainsides
Slope	30 to 50 percent	30 to 50 percent
Typical Vegetation Series	Pinyon pine or juniper	Pinyon pine or juniper

Soil Profile Description

Surface Layer	Depth to hard limestone is 10 to 20 inches. The profile is loam or sandy loam and is 5 to 50 percent rock fragments; pH 7.9 to 9.0. The profile is strongly to violently effervescent. Mean annual soil temperature is 47 to 63 degrees F.	0 to 11 inches; brown very cobbly fine sandy loam; weak granular structure; soft; slightly effervescent; pH 8.0
Subsoil		11 to 24 inches; light yellowish brown very cobbly fine sandy loam; massive; soft; slightly effervescent; pH 8.0
Substratum		24 to 46 inches; yellow very cobbly sandy loam; massive; soft; strongly effervescent; pH 8.0 46 inches; hard, fractured limestone

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	20 to 45
Available Water Capacity	Very low	Low
Water Retention Class	3	2
Hydrologic Soil Group	C	B
Permeability	Moderately rapid to very rapid	Moderate
Maximum Erosion Hazard	High	High
Erosion Factor K		.16
Drainage Class	Somewhat excessively drained to excessively drained	Well drained
Soil Manageability		
Group	III	III
Class	3EPXdg	3Epg
Soil Productivity	Very low	Low
Forage Production Class	2-3	3
Forest Survey Site Class	7	7
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of Rock outcrop (associated with Lithic Xerorthents, calcareous) and soils that are similar to those of the Lizzant family but are less than 35 percent rock fragments throughout the soil profile or have a mean annual soil temperature higher than 47 degrees F (elevations below 6,500 feet) or both. Included areas make up 25 percent of the unit.

FsD—Wilshire - Oak Glen, dry families association, 2 to 15 percent slopes

Elevation: 3,800 to 6,000 feet Annual Precipitation: 10 to 25 inches

Soil Map Unit Components	**Wilshire family**	**Oak Glen family, dry**
Approximate Proportion	50 percent	25 percent
Landscape Position	Flood plains, along drainageways, and on some alluvial fans	Alluvial fans or terraces
Slope	2 to 10 percent	5 to 15 percent
Typical Vegetation Series	Canyon live oak, Coulter pine, ceanothus, or Joshua tree	Coulter pine, canyon live oak, ceanothus, or Joshua tree

Soil Profile Description

Surface Layer	0 to 5 inches; light brownish gray very gravelly coarse sand; single grain; loose; pH 7.0	0 to 14 inches; dark grayish brown sandy loam; weak granular structure; soft; pH 6.5
Subsoil	5 to 15 inches; light brownish gray extremely cobbly coarse sand; single grain; loose; pH 6.5	14 to 23 inches; grayish brown coarse sandy loam; weak granular structure; slightly hard; pH 6.5
Substratum	15 to 60 inches; light brownish gray very gravelly coarse sand; single grain; loose; pH 7.0 60 inches; mixed alluvium	23 to 60 inches; grayish brown sandy loam; massive; hard; pH 6.5 60 inches; mixed alluvium

Soil Properties & Management Interpretations

Effective Rooting Depth	60	60
Available Water Capacity	Very low	Moderate
Water Retention Class	3	2
Hydrologic Soil Group	A	B
Permeability	Very rapid	Moderately rapid
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.05	.17
Drainage Class	Somewhat excessively drained	Well drained
Soil Manageability		
Group	II	II
Class	2Pe	2ep
Soil Productivity	Very low	Low
Forage Production Class	2	4
Forest Survey Site Class	7	7
Chaparral Class	1-2	2-3

Included Areas and Remarks: Included in this unit are areas of soils of the Avawatz family associated with Wilshire family, soils that are similar to those of the Oak Glen family, dry but are 35 to 45 per cent rock fragments in the upper 40 inches of the soil profile, and soils that receive as much as 30 inches precipitation annually and support ponderosa/Jeffrey pine (Wrightwood area). Included areas make up 25 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will improve available water capacity.

G—Badland

Elevation: 2,000 to 4,500 feet Annual Precipitation: 8 to 25 inches

Soil Map Unit Components	**Badland**
Approximate Proportion	80 percent
Landscape Position	Terrace escarpments
Slope	30 to 100 percent
Typical Vegetation Series	Barren

Soil Profile Description

Surface Layer	Badland is steep, barren land that is dissected by many intermittent drainageways. Runoff is very high, and geologic erosion is very active.
Subsoil	
Substratum	

Soil Properties & Management Interpretations

Effective Rooting Depth	
Available Water Capacity	
Water Retention Class	
Hydrologic Soil Group	
Permeability	
Maximum Erosion Hazard	
Erosion Factor K	
Drainage Class	
Soil Manageability Group Class	
Soil Productivity	
Forage Production Class	
Forest Survey Site Class	
Chaparral Class	
Included Areas and Remarks:	Included in this unit are areas of soils of the Avawatz family in drainageways or on flood plains and soils of the Morical, dry family on terrace remnants, Typic Xerorthents, warm, and Typic Haploxeralfs. Included areas make up 20 percent of the unit. This unit occurs in the area of Rouse Ridge and Baustista Canyon.

GrEF—Green Bluff - Brader families association, 15 to 50 percent slopes

Elevation: 4,500 to 6,000 feet Annual Precipitation: 20 to 30 inches

Soil Map Unit Components	**Green Bluff family**	**Brader family**
Approximate Proportion	50 percent	25 percent
Landscape Position	North to east aspects of foot slopes of mountainsides	South to west aspects of upper slopes of mountainsides
Slope	15 to 40 percent	25 to 50 percent
Typical Vegetation Series	Ponderosa/Jeffrey pine or Coulter pine	Canyon live oak or Coulter pine

Soil Profile Description

Surface Layer	0 to 6 inches; dark grayish brown gravelly coarse sandy loam; weak granular structure; soft; pH 7.0	0 to 3 inches; brown gravelly loamy coarse sand; weak granular structure; soft; pH 6.5
Subsoil	6 to 22 inches; light yellowish brown gravelly coarse sandy loam; massive; soft; pH 6.5	3 to 16 inches; yellowish brown gravelly coarse sandy loam; weak subangular blocky structure; soft; pH 6.5
Substratum	22 to 26 inches; pale brown loamy coarse sand; single grain; loose; pH 6.5 26 inches; highly weathered granodiorite	16 to 19 inches; light yellowish brown very gravelly loamy coarse sand; massive; soft; pH 6.0 19 inches; highly weathered granite

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 50	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	3	3
Hydrologic Soil Group	B	C
Permeability	Moderately rapid	Moderately rapid
Maximum Erosion Hazard	High	High
Erosion Factor K	.15	.16
Drainage Class	Well drained	Somewhat excessively drained
Soil Manageability Group Class	 II 2EPg	 II 3EPgd
Soil Productivity	Moderate	Low
Forage Production Class	4	4
Forest Survey Site Class	5	6
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of soils of the Pacifico and Preston families and Rock outcrop. Included areas make up 25 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant cover at or near the surface will help improve available water capacity.

HoD—Morical, very deep - Hodgson families association, 2 to 15 percent slopes

Elevation: 5,000 to 6,000 feet Annual Precipitation: 20 to 35 inches

Soil Map Unit Components	**Morical family, very deep**	**Hodgson family**
Approximate Proportion	60 percent	20 percent
Landscape Position	Valley floors	Open exposed areas known as "pavement plains" on old terrace remnants
Slope	5 to 15 percent	2 to 10 percent
Typical Vegetation Series	Ponderosa/Jeffrey pine, pinyon pine, or juniper	Buckwheat

Soil Profile Description

Surface Layer	0 to 6 inches; brown gravelly loam; weak granular structure; hard; pH 6.7	0 to 2 inches; dark yellowish brown loam; weak subangular blocky parting to moderate granular; slightly hard; pH 7.2
Subsoil	6 to 36 inches; reddish yellow gravelly sandy clay loam; moderate subangular blocky structure; very hard; pH 6.7	2 to 60 inches; yellowish red clay; strong subangular blocky structure; very hard; pH 7.0
Substratum	36 to 60 inches; light brown sandy loam; massive; slightly hard; pH 7.0 60 inches; slightly consolidated alluvium	60 inches; alluvium

Soil Properties & Management Interpretations

Effective Rooting Depth	60	60
Available Water Capacity	Moderate	High
Water Retention Class	1	1
Hydrologic Soil Group	B	D
Permeability	Moderately slow	Very slow
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.17	.27
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	II	II
Class	2e	2e
Soil Productivity	Moderate	Moderate
Forage Production Class	5	5
Forest Survey Site Class	5	NC
Chaparral Class	NA	1

Included Areas and Remarks: Included in this unit are areas of soils of the Oak Glen family and soils that are similar to Morical family, very deep but are sandy loam textures throughout the soil profile. In the Garner Valley area, on old terraces, soils of the Morical family, dry are dominant (supporting chamise and manzanita rather than woodland). Included areas make up 20 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant cover at or near the surface will help improve available water capacity.

HoE—Morical, very deep - Hodgson families association, 15 to 30 percent slopes

Elevation: 5,000 to 6,000 feet Annual Precipitation: 20 to 35 inches

Soil Map Unit Components	**Morical family, very deep**	**Hodgson family**
Approximate Proportion	65 percent	15 percent
Landscape Position	Alluvial fans and terraces	Open exposed areas known as "pavement plains" on old terrace remnants
Slope	15 to 30 percent	15 to 25 percent
Typical Vegetation Series	Ponderosa/Jeffrey pine, pinyon pine, or juniper	Buckwheat

Soil Profile Description

Surface Layer	0 to 6 inches; brown gravelly loam; weak granular structure; hard; pH 6.7	0 to 2 inches; dark yellowish brown loam; weak subangular blocky structure parting to moderate granular; slightly hard; pH 7.2
Subsoil	6 to 36 inches; reddish yellow gravelly sandy clay loam; moderate subangular blocky structure; very hard; pH 6.7	2 to 60 inches; yellowish red clay; strong subangular blocky structure; very hard; pH 7.0
Substratum	36 to 60 inches; light brown sandy loam; massive; slightly hard; pH 7.0 60 inches; slightly consolidated alluvium	60 inches; alluvium

Soil Properties & Management Interpretations

Effective Rooting Depth	60	60
Available Water Capacity	Moderate	High
Water Retention Class	1	1
Hydrologic Soil Group	B	D
Permeability	Moderately slow	Very slow
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.17	.27
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	II	II
Class	2e	2e
Soil Productivity	Moderate	Moderate
Forage Production Class	5	5
Forest Survey Site Class	5	NC
Chaparral Class	NA	1

Included Areas and Remarks: Included in this unit are soils of the Oak Glen family and soils that are similar to Morical family, very deep but are sandy loam textures throughout the soil profile. Included areas make up 20 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant cover at or near the surface will help improve available water capacity.

JoG—Springdale, dry - Olete families complex, 50 to 75 percent slopes

Elevation: 4,000 to 6,200 feet Annual Precipitation: 15 to 25 inches

Soil Map Unit Components	**Springdale family, dry**	**Olete family**
Approximate Proportion	40 percent	30 percent
Landscape Position	Mountainsides	Mountainsides
Slope	50 to 75 percent	50 to 65 percent
Typical Vegetation Series	Ceanothus, pinyon pine, bigcone Douglas-fir, or canyon live oak	Ceanothus, pinyon pine, bigcone Douglas-fir, or canyon live oak

Soil Profile Description

Surface Layer	0 to 5 inches; brown gravelly loamy coarse sand; weak granular structure; soft; pH 7.3	0 to 3 inches; dark brown very cobbly fine sandy loam; massive; soft; pH 7.3
Subsoil	5 to 25 inches; pale brown very gravelly loamy sand; single grain; pH 7.0	3 to 26 inches; yellowish brown very cobbly loam; weak subangular blocky structure; slightly hard; pH 7.0
Substratum	25 to 45 inches; very pale brown very gravelly coarse sand; single grain; loose; pH 7.0 35 inches; slightly weathered fractured granite	26 inches; highly fractured gneiss

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 50	20 to 40
Available Water Capacity	Very low	Very low
Water Retention Class	3	2
Hydrologic Soil Group	B	B
Permeability	Very rapid	Moderate
Maximum Erosion Hazard	High	Very high
Erosion Factor K	.14	.17
Drainage Class	Somewhat excessively drained	Well drained
Soil Manageability		
Group	IV	IV
Class	4EPG	4EPG
Soil Productivity	Very low	Low
Forage Production Class	NC	NC
Forest Survey Site Class	NC	NC
Chaparral Class	3	2

Included Areas and Remarks: Included in this unit are areas of Rock outcrop, Lithic Xerorthents, dry (associated with Springdale family, dry), and soils of the Goulding family associated with Olete family. There are also soils that are similar to those of the Tollhouse family on broad rounded ridges with less than 30 percent slopes. Included areas make up 20 percent of the unit. The soils in this unit have a high potential for movement due to dry ravel if the protective cover is removed.

JrG—Lithic Xerorthents, dry - Springdale family, dry - Rubble land association, 50 to 100 percent slopes

Elevation: 4,000 to 6,200 Feet Annual Precipitation: 15 to 25 inches

Soil Map Unit components	**Lithic Xerorthents, dry**	**Springdale Family, dry**	**Rubble land**
Approximate Proportion	35 percent	20 percent	15 percent
Landscape Position	Mountainsides (mainly south to west aspects) and on narrow ridges	Mountainsides (mainly north to east aspects) or colluvial areas	Colluvial areas of mountainsides
Slope	60 to 90 percent	50 to 75 percent	75 to 100 percent
Typical Vegetation Series	Ceanothus or pinyon pine	Pinyon pine or ceanothus	Barren

Soil Profile Description

Surface Layer	Depth to hard rock is 10 to 20 inches. The profile is loam, sandy loam, or loamy sand and is 35 to 80 percent rock fragments. Mean annual soil temperature is 54 to 59 degrees F.	0 to 5 inches; brown gravelly loamy coarse sand; weak granular structure; soft; pH 7.3	Rubble land consists of areas of detached rock fragments that have accumulated on very steep to extremely steep mountainsides as talus shoots These areas support little or no vegetation and are subject to frequent landslides.
Subsoil		5 to 25 inches; pale brown very gravelly loamy sand; single grain; pH 7.0	
Substratum		25 to 45 inches; light olive brown very gravelly coarse sand; single grain; loose; pH 7.0 45 inches; slightly weathered fractured granite	

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	20 to 50
Available Water Capacity	Very low	Very low
Water Retention Class	3	3
Hydrologic Soil Group	C	B
Permeability	Moderately rapid to very rapid	Very rapid
Maximum Erosion Hazard	Very high	High
Erosion Factor K		.14
Drainage Class	Somewhat excessively drained to excessively drained	Somewhat excessively drained
Soil Manageability		
Group	IV	IV
Class	4EPGxd	4EPG
Soil Productivity	Very low	Very low
Forage Production Class	NC	NC
Forest Survey Site Class	NC	NC
Chaparral Class	2	3

Included Areas and Remarks: Included in this unit are areas of Rock outcrop (associated with Lithic Xerorthents, dry), soils that are similar to those of Tollhouse family on broad rounded ridges with less than 50 percent slopes, soils of the Olete and Goulding families, and Lithic Xerorthents, calcareous that are underlain by limestone. Included areas make up 30 percent of the unit. The soils in this unit have a high potential for movement due to dry ravel if the protective cover is removed.

KoD—Wind River - Oak Glen families association, 2 to 15 percent slopes

Elevation: 4,600 to 6,000 feet Annual Precipitation: 20 to 35 inches

Soil Map Unit Components	**Wind River family**	**Oak Glen family**
Approximate Proportion	50 percent	25 percent
Landscape Position	Hillsides adjacent to drainageways or on broad rounded ridges	Drainageways and concave areas of hills
Slope	5 to 15 percent	2 to 10 percent
Typical Vegetation Series	Coulter pine, canyon live oak, or ponderosa/ Jeffrey pine	Ponderosa/Jeffrey pine or Coulter pine

Soil Profile Description

Surface Layer	0 to 19 inches; brown sandy loam; moderate granular structure; soft; pH 7.0	0 to 15 inches; dark grayish brown sandy loam; massive; soft; pH 7.0
Subsoil	19 to 34 inches; light yellowish brown sandy loam; massive; slightly hard; pH 6.5	15 to 30 inches; dark grayish brown sandy loam; massive; soft; pH 6.8
Substratum	34 to 45 inches; very pale brown sandy loam; massive; slightly hard; pH 6.7 45 inches; highly weathered granite	30 to 60 inches; grayish brown sandy loam; massive; slightly hard; pH 6.8 60 inches; mixed alluvium

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 55	60
Available Water Capacity	Moderate	Moderate
Water Retention Class	2	2
Hydrologic Soil Group	B	B
Permeability	Moderately rapid	Moderately rapid
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.11	.17
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	II	II
Class	2ep	2ep
Soil Productivity	Low	Moderate
Forage Production Class	5	5
Forest Survey Site Class	5	5
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of soils of the Pacifico, Preston, and Tollhouse families and Rock outcrop. Included areas make up 25 percent of the unit. Oak Glen family is the more dominant component on the valley floor in the Idyllwild area. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

LcF—Lithic Xerorthents, calcareous - Rock outcrop complex, 30 to 50 percent slopes

Elevation: 5,000 to 7,600 feet Annual Precipitation: 10 to 20 inches

Soil Map Unit Components	**Lithic Xerorthents, calcareous**	**Rock outcrop**
Approximate Proportion	50 percent	25 percent
Landscape Position	Mountainsides	Mountainsides
Slope	30 to 50 percent	30 to 50 percent
Typical Vegetation Series	Pinyon pine, Joshua tree, or juniper-scrub oak-pinyon	Barren

Soil Profile Description

Surface Layer	Depth to hard limestone is 10 to 20 inches. The profile is loam or sandy loam and is 5 to 50 percent rock fragments; pH is 7.9 to 9.0. The profile is strongly to violently effervescent. Mean annual soil temperature is 47 to 63 degrees F.	Rock outcrop consists of exposed bedrock with less than 15 percent included areas of soil material capable of supporting vegetation.
Subsoil		
Substratum		

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20
Available Water Capacity	Very low
Water Retention Class	3
Hydrologic Soil Group	C
Permeability	Moderately rapid to very rapid
Maximum Erosion Hazard	High
Erosion Factor K	
Drainage Class	Somewhat excessively drained
Soil Manageability	
Group	III
Class	3EPdg
Soil Productivity	Very low
Forage Production Class	1 or 2
Forest Survey Site Class	7
Chaparral Class	NA
Included Areas and Remarks:	Included in this unit are areas of soils of the Lizzant family and soils that are similar to the Lizzant but are less than 35 percent rock fragments throughout the soil profile, or have a lighter colored surface layer, or both. Included areas make up 25 percent of the unit.

LcG—Lithic Xerorthents, calcareous - Rock outcrop complex, 50 to 100 percent slopes

Elevation: 5,000 to 7,600 feet Annual Precipitation: 10 to 20 inches

Soil Map Unit Components	**Lithic Xerorthents, calcareous**	**Rock outcrop**
Approximate Proportion	50 percent	35 percent
Landscape Position	Mountainsides	Mountainsides
Slope	50 to 75 percent	50 to 100 percent
Typical Vegetation Series	Pinyon pine or juniper-scrub oak-pinyon	Barren

Soil Profile Description

Surface Layer	Depth to hard limestone is 10 to 20 inches. The profile is loam or sandy loam and is 5 to 50 percent rock fragmemts; pH is 7.9 to 9.0. The profile is strongly to violently effervescent. Mean annual soil temperature is 47 to 63 degrees F.	Rock outcrop consists of exposed bedrock with less than 15 percent included areas of soil material capable of supporting vegetation.
Subsoil		
Substratum		

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20
Available Water Capacity	Very low
Water Retention Class	3
Hydrologic Soil Group	C
Permeability	Moderately rapid to very rapid
Maximum Erosion Hazard	Very high
Erosion Factor K	
Drainage Class	Somewhat excessively drained to excessively drained
Soil Manageability	
Group	IV
Class	4EPGd
Soil Productivity	Very low
Forage Production Class	NC
Forest Survey Site Class	7
Chaparral Class	NA
Included Areas and Remarks:	Included in this unit are areas of soils of the Lizzant family and soils that are similar to the Lizzant family but are less than 35 percent rock fragments throughout the soil profile, or have a lighter color surface layer, or both. Included areas make up 15 percent of this unit. The soils in this unit have a high potential for movement due to dry ravel if the protective cover is removed.

LdG—Lithic Xerorthents, cool - Rock outcrop complex, 50 to 100 percent slopes

Elevation: 7,000 to 10,000 feet Annual Precipitation: 30 to 40 inches

Soil Map Unit Components	**Lithic Xerorthents, cool**	**Rock outcrop**
Approximate Proportion	50 percent	30 percent
Landscape Position	Mountainsides	Mountainsides
Slope	50 to 75 percent	50 to 100 percent
Typical Vegetation Series	Jeffrey pine or lodgepole pine	Barren

Soil Profile Description

Surface Layer	Depth to hard rock is 10 to 20 inches. The profile is loam, sandy loam, or loamy sand and is 80 percent rock fragments. Mean annual soil temperature is 40 to 47 degrees F.	Rock outcrop consists of exposed bedrock with less than 15 percent included areas of soil material capable of supporting vegetation.
Subsoil		
Substratum		

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20
Available Water Capacity	Very low
Water Retention Class	3
Hydrologic Soil Group	C
Permeability	Moderately rapid to very rapid
Maximum Erosion Hazard	Very high
Erosion Factor K	
Drainage Class	Somewhat excessively drained to excessively drained
Soil Manageability	
Group	IV
Class	4EPGd
Soil Productivity	Very low
Forage Production Class	NC
Forest Survey Site Class	7
Chaparral Class	NA
Included Areas and Remarks:	Included in this unit are areas of Rubble land, soils of the Wapal family, and soils of the Merkel family that have slopes of 35 to 50 percent. Included areas make up 20 percent of the unit. Lodgepole pine is confined to elevations above 8,000 feet. The soils in this unit have a high potential for movement due to dry ravel if the protective cover is removed.

LrG—Lithic Xerorthents - Rock outcrop complex, 50 to 100 percent slopes

Elevation: 4,000 to 7,600 feet Annual Precipitation: 25 to 35 inches

Soil Map Unit Components	**Lithic Xerorthents**	**Rock outcrop**
Approximate Proportion	50 percent	25 percent
Landscape Position	Mountainsides	Mountainsides
Slope	50 to 75 percent	50 to 100 percent
Typical Vegetation Series	Coulter pine, canyon live oak, or ponderosa/Jeffrey pine	Barren

Soil Profile Description

Surface Layer	Depth to hard rock is 10 to 20 inches. The profile is loam or loamy sand and is 35 to 80 percent rock fragments. Mean annual soil temperature is 47 to 54 degrees F.	Rock outcrop consists of exposed bedrock with less than 15 percent included areas of soil material capable of supporting vegetation.
Subsoil		
Substratum		

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20
Available Water Capacity	Very low
Water Retention Class	3
Hydrologic Soil Group	C
Permeability	Moderately rapid to very rapid
Maximum Erosion Hazard	Very high
Erosion Factor K	
Drainage Class	Somewhat excessively drained to excessively drained
Soil Manageability	
Group	IV
Class	4EPGd
Soil Productivity	Very low
Forage Production Class	NC
Forest Survey Site Class	7
Chaparral Class	NA
Included Areas and Remarks:	Included in this unit are areas of Rubble land, soils of the Springdale family, shallow soils that have a deep dark surface layer, and Lithic Xerorthents, dry. Included areas make up 25 percent of the unit. The soils in this unit have a high potential for movement due to dry ravel if the protective cover is removed.

MbE—Morical - Wind River families complex, 15 to 30 percent slopes

Elevation: 4,500 to 6,000 feet Annual Precipitation: 25 to 35 inches

Soil Map Unit Components	**Morical family**	**Wind River family**
Approximate Proportion	50 percent	25 percent
Landscape Position	Hillsides	Hillsides
Slope	15 to 30 percent	15 to 30 percent
Typical Vegetation Series	Ponderosa/Jeffrey pine or Coulter pine	Ponderosa/Jeffrey pine or Coulter pine

Soil Profile Description

Surface Layer	0 to 8 inches; grayish brown loam; moderate granular structure; hard; pH 7.0	0 to 19 inches; brown sandy loam; moderate granular structure; soft; pH 7.0
Subsoil	8 to 50 inches; brownish yellow and yellowish brown clay loam; moderate subangular blocky structure; hard; pH 6.5	19 to 34 inches; light yellowish brown sandy loam; massive; slightly hard; pH 6.5
Substratum	50 inches; highly weathered granodiorite	34 to 45 inches; very pale brown sandy loam; massive; slightly hard; pH 6.7 45 inches; highly weathered granite

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 50	20 to 55
Available Water Capacity	Moderate	Moderate
Water Retention Class	1	2
Hydrologic Soil Group	B	B
Permeability	Moderately slow	Moderately rapid
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.23	.11
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	II	II
Class	2e	2ep
Soil Productivity	Moderate	Low
Forage Production Class	6	5
Forest Survey Site Class	5	5
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are soils of the Brader family (supporting canyon live oak), soils of the Oak Glen family on fans and in drainageways, soils of the Preston family, and Rock outcrop (in the Delamar Mountain area). Included areas make up 25 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant cover at or near the surface will help improve available water capacity.

MbF—Morical - Wind River families complex, 15 to 30 percent slopes

Elevation: 4,500 to 6,000 feet Annual Precipitation: 25 to 35 inches

Soil Map Unit Components	**Morical family**	**Wind River family**
Approximate Proportion	40 percent	35 percent
Landscape Position	Mountainsides	Mountainsides
Slope	30 to 50 percent	30 to 50 percent
Typical Vegetation Series	Ponderosa/Jeffrey pine or Coulter pine	Ponderosa/Jeffrey pine or Coulter pine

Soil Profile Description

Surface Layer	0 to 8 inches; grayish brown loam; moderate granular structure; hard; pH 7.0	0 to 19 inches; brown sandy loam; moderate granular structure; soft; pH 7.0
Subsoil	8 to 50 inches; brownish yellow and yellowish brown clay loam; moderate subangular blocky structure; hard; pH 6.5	19 to 34 inches; light yellowish brown sandy loam; massive; slightly hard; pH 6.5
Substratum	50 inches; highly weathered granodiorite	34 to 45 inches; very pale brown sandy loam; massive; slightly hard; pH 6.7 45 inches; highly weathered granite

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 50	20 to 55
Available Water Capacity	Moderate	Moderate
Water Retention Class	1	2
Hydrologic Soil Group	B	B
Permeability	Moderately slow	Moderately rapid
Maximum Erosion Hazard	High	High
Erosion Factor K	.23	.11
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	III	III
Class	3Eg	3Egp
Soil Productivity	Moderate	Low
Forage Production Class	6	5
Forest Survey Site Class	5	5
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are soils of the Brader family (supporting canyon live oak), soils that are similar to the Morical family but have a deep dark surface layer, and Rock outcrop. Included areas make up 25 percent of the unit.

MoFG—Typic Xerorthents - Morical family, dry association, 30 to 75 percent slopes

Elevation: 4,000 to 5,500 feet Annual Precipitation: 8 to 20 inches

Soil Map Unit Components	**Typic Xerorthents**	**Morical family, dry**
Approximate Proportion	50 percent	30 percent
Landscape Position	Terrace escarpments or old fan deposits	Ridge crests, toe slopes and side slopes of terrace remnants
Slope	30 to 75 percent	30 to 50 percent
Typical Vegetation Series	Ceanothus, chamise, or manzanita	Juniper-scrub oak-pinyon (Cajon pass only), chamise, or ceanothus

Soil Profile Description

Surface Layer	The soils on the terrace escarpments are loamy sand or sandy loam and are 0 to 70 percent gravel; the soils on the old fan deposits are loamy sand and are 20 75 percent rock fragments. Mean annual soil temperature is 47 to 59 degrees F.	0 to 4 inches; brown gravelly loam; moderate granular structure; hard; pH 6.5
Subsoil		4 to 23 inches; light yellowish brown gravelly clay loam; moderate subangular blocky structure; hard; pH 6.5
Substratum		23 to 39 inches; light yellowish brown loam; moderate subangular blocky structure; hard; pH 6.5 39 to 60 inches; light yellowish brown sandy loam; massive; hard; pH 7.0 60 inches; weakly cemented alluvium

Soil Properties & Management Interpretations

Effective Rooting Depth	60	60
Available Water Capacity	Very low to low	Moderate
Water Retention Class	2-3	1
Hydrologic Soil Group	A or B	B
Permeability	Moderately rapid to very rapid	Moderately slow
Maximum Erosion Hazard	High or very high	High
Erosion Factor K		.20
Drainage Class	Somewhat excessively drained and excessively drained	Well drained
Soil Manageability		
Group	IV	IV
Class	4Epg-4EPG	3Eg
Soil Productivity	Very low	Very low
Forage Production Class	NC	4
Forest Survey Site Class	NC	NC
Chaparral Class	2	3

Included Areas and Remarks: Included in this unit are soils of the Wrightwood family and the Ramona family and Typic Xerorthents, warm. Included areas make up 20 percent of the unit. Old fan deposits in the Garner Valley area have slopes of 30 to 50 percent. The Typic Xerorthents on slopes greater than 50 percent have a high potential for movement due to dry ravel if the protective cover is removed.

OmD—Oak Glen - Ruch families complex, 2 to 15 percent slopes

Elevation: 4,000 to 6,500 feet Annual Precipitation: 20 to 30 inches

Soil Map Unit Components	**Oak Glen family**	**Ruch family**
Approximate Proportion	40 percent	30 percent
Landscape Position	Alluvial fans and terraces (mainly in the concave areas)	Alluvial fans and terraces (mainly on the convex side slopes)
Slope	2 to 10 percent	5 to 15 percent
Typical Vegetation Series	Coulter pine or ponderosa /Jeffrey pine (ceanothus or manzanita in much of the Santa Ana Canyon area)	Coulter pine or ponderosa /Jeffrey pine (ceanothus or manzanita in much of the Santa Ana Canyon area)

Soil Profile Description

Surface Layer	0 to 15 inches; dark grayish brown sandy loam; massive; soft; pH 7.0	0 to 9 inches; pale brown loam; weak granular structure; soft; pH 6.4
Subsoil	15 to 30 inches; dark grayish brown sandy loam; massive; soft; pH 6.8	9 to 23 inches; light yellowish brown loam; moderate subangular blocky structure; slightly hard; pH 6.6 23 to 32 inches; yellowish brown sandy loam; massive; slightly hard; pH 6.6
Substratum	30 to 60 inches; grayish brown sandy loam; massive; slightly hard; pH 6.8 60 inches; mixed alluvium	32 to 60 inches; light yellowish brown gravelly loamy sand; massive; slightly hard; pH 6.6 60 inches; mixed alluvium

Soil Properties & Management Interpretations

Effective Rooting Depth	60	60
Available Water Capacity	Moderate	Moderate
Water Retention Class	2	1
Hydrologic Soil Group	B	B
Permeability	Moderately rapid	Moderately slow
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.17	.23
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	II	II
Class	2ep	2e
Soil Productivity	Moderate	High
Forage Production Class	5	6
Forest Survey Site Class	5-6	5-6
Chaparral Class	3	4

Included Areas and Remarks: Included in this unit are soils of the Avawatz family and soils of the Wilshire family in upper reaches of drainageways; soils of the Morical family, very deep; and soils of the Ramona family. Included areas make up 30 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

PsD—Avawatz - Oak Glen, dry families association, 2 to 15 percent slopes

Elevation: 3,200 to 6,000 feet Annual Precipitation: 10 to 20 inches

Soil Map Unit Components	**Avawatz family**	**Oak Glen family, dry**
Approximate Proportion	50 percent	25 percent
Landscape Position	Drainageways and flood plains	Alluvial fans, terraces, and along some drainageways
Slope	2 to 10 percent	5 to 15 percent
Typical Vegetation Series	Ceanothus, pinyon-scrub oak-juniper, or pinyon pine	Ceanothus, pinyon-scrub oak-juniper, or pinyon pine

Soil Profile Description

Surface Layer	0 to 8 inches; brown gravelly loamy coarse sand; weak granular structure; soft; pH 7.0	0 to 14 inches; dark grayish brown sandy loam; weak granular structure; soft; pH 6.5
Subsoil	8 to 22 inches; brown gravelly coarse sand; single grain; loose; pH 6.8	14 to 23 inches; grayish brown coarse sandy loam; weak granular structure; slightly hard; pH 6.5
Substratum	22 to 60 inches; grayish brown loamy coarse sand; massive; soft; pH 6.8 60 inches; mixed alluvium	23 to 60 inches; brown sandy loam; massive; hard; pH 6.5 60 inches; mixed alluvium

Soil Properties & Management Interpretations

Effective Rooting Depth	60	60
Available Water Capacity	Low	Moderate
Water Retention Class	3	2
Hydrologic Soil Group	A	B
Permeability	Rapid	Moderately rapid
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.14	.17
Drainage Class	Somewhat excessively drained	Well drained
Soil Manageability		
Group	II	II
Class	2Pe	2ep
Soil Productivity	Very low	Low
Forage Production Class	2	4
Forest Survey Site Class	7	7
Chaparral Class	3	2-3

Included Areas and Remarks: Included in this unit are areas of soils of the Wilshire family, Riverwash, and soils of the Hodgson family on some of the old terraces (pavement plains) east of Big Bear Lake. Included areas make up 25 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant material at or near the surface will help improve available water capacity.

RLG—Rubble land - Lithic Xerorthents association, 50 to 100 percent slopes

Elevation: 5,000 to 8,000 feet Annual Precipitation: 25 to 35 inches

Soil Map Unit Components	**Rubble land**	**Lithic Xerorthents**
Approximate Proportion	40 percent	35 percent
Landscape Position	Colluvial areas of mountainsides	Mountainsides and narrow ridges
Slope	70 to 100 percent	50 to 75 percent
Typical Vegetation Series	Barren	Coulter pine, canyon live oak, or ponderosa/Jeffrey pine

Soil Profile Description

Surface Layer	Rubble land consists of areas of detached rock fragments which have accumulated on very steep to extremely steep mountainsides as talus shoots. These areas support little or no vegetation and are subject to frequent landsliding.	Depth to hard rock is 10 to 20 inches. The profile is loam, sandy loam, or loamy sand and is 35 to 80 percent rock fragments. Mean annual soil temperature is 47 to 54 degrees F.
Subsoil		
Substratum		

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20
Available Water Capacity	Very low
Water Retention Class	3
Hydrologic Soil Group	C
Permeability	Moderately rapid to very rapid
Maximum Erosion Hazard	Very high
Erosion Pactor K	
Drainage Class	Somewhat excessively drained and excessively drained
Soil Manageability Group	IV
Class	4EPGd
Soil Productivity	Very low
Forage Production Class	NC
Forest Survey Site Class	7
Chaparral Class	NA

Included Areas and Remarks: Included in this unit are areas of Rock outcrop and soils of the Springdale family. Included areas make up 25 percent of the unit. This unit occurs in the area of the Cucamonga Wilderness. The soils in this unit have a high potential for movement due to dry ravel if the protective cover is removed.

Rs—Rock outcrop, 30 to 100 percent slopes

Elevation: 2,000 to 10,000 feet Annual Precipitation: 10 to 40 inches

Soil Map Unit Components	**Rock outcrop**
Approximate Proportion	85 percent
Landscape Position	Mountainsides
Slope	30 to 100 percent
Typical Vegetation Series	Barren

Soil Profile Description

Surface Layer	Rock outcrop consists of exposed bedrock with less than 15 percent included areas of soil material capable of supporting vegetation.
Subsoil	
Substratum	

Soil Properties & Management Interpretations

Effective Rooting Depth	
Available Water Capacity	
Water Retention Class	
Hydrologic Soil Group	
Permeability	
Maximum Erosion Hazard	
Erosion Factor K	
Drainage Class	
Soil Manageability Group Class	
Soil Productivity	
Forage Production Class	
Forest Survey Site Class	
Chaparral Class	
Included Areas and Remarks:	Included in this unit are areas of Typic Xerorthents, warm and the calcareous, cool, and warm phases of Lithic Xerorthents. Included areas make up 15 percent of this unit. This unit occurs in the area of Mormon Rocks and along the San Jacinto fault scarp.

Ru—Rubble land - Rock outcrop complex, 50 to 100 percent slopes

Elevation: 4,000 to 11,500 feet Annual Precipitation: 15 to 35 inches

Soil Map Unit Components	**Rubble land**	**Rock outcrop**
Approximate Proportion	50 percent	35 percent
Landscape Position	Mountainsides	Mountainsides
Slope	50 to 100 percent	50 to 100 percent
Typical Vegetation Series	Barren	Barren

Soil Profile Description

Surface Layer	Rubble land consists of areas of detached rock fragments that have accumulated on very steep to extremely steep mountainsides as talus shoots. These areas support little or no vegetation and are subject to frequent landsliding.	Rock outcrop consists of exposed bedrock with less than 15 percent included areas of soil material capable of supporting vegetation.
Subsoil		
Substratum		

Soil Properties & Management Interpretations

Effective Rooting Depth	
Available Water Capacity	
Water Retention Class	
Hydrologic Soil Group	
Permeability	
Maximum Erosion Hazard	
Erosion Factor K	
Drainage Class	
Soil Manageability Group Class	
Soil Productivity	
Forage Production Class	
Forest Survey Site Class	
Chaparral Class	
Included Areas and Remarks:	Included in this unit are areas of soils of the Goulding and Springdale families, Lithic Xerorthents, and the cool and calcareous phases of Lithic Xerorthents. Included areas make up 15 percent of the unit. This unit occurs in the area of San Gorgonio Mountain, Mount Harwood, Mount San Antonio, and Blackhawk Canyon.

Rw—Riverwash

Elevation: 1,600 to 6,000 feet Annual Precipitation: 10 to 35 inches

Soil Map Unit Components	**Riverwash**
Approximate Proportion	80 percent
Landscape Position	Drainageways
Slope	2 to 10 percent
Typical Vegetation Series	Barren

Soil Profile Description

Surface Layer	Riverwash consists of unstabilized sandy, gravelly, cobbly, and stony material that is flooded, washed, and reworked by rivers so frequently that it supports little or no vegetation.
Subsoil	
Substratum	

Soil Properties & Management Interpretations

Effective Rooting Depth	
Available Water Capacity	
Water Retention Class	
Hydrologic Soil Group	
Permeability	
Maximum Erosion Hazard	
Erosion Factor K	
Drainage Class	
Soil Manageability Group Class	
Soil Productivity	
Forage Production Class	
Forest Survey Site Class	
Chaparral Class	
Included Areas and Remarks:	Included in this unit are areas of soils of the Avawatz family, the Soboba family, and the Wilshire family. Included areas make up 20 percent of the unit. This unit occurs in Bear Creek, Lytle Creek, Mill Creek, Santa Ana River, and the San Gorgonio River.

SaEF—San Andreas - Osito - Modesto families complex, 15 to 50 percent slopes

Elevation: 2,400 to 4,500 feet Annual Precipitation: 15 to 25 inches

Soil Map Unit Components	San Andreas family	Osito family	Modesto family
Approximate Proportion	35 percent	25 percent	20 percent
Landscape Position	Mountainsides	Mountainsides	Hillsides
Slope	15 to 40 percent	15 to 50 percent	15 to 30 percent
Typical Vegetation Series	Chamise, manzanita, or ceanothus	Chamise, manzanita, or ceanothus	Chamise, manzanita, or ceanothus

Soil Profile Description

Surface Layer	0 to 7 inches; brown gravelly sandy loam; weak granular structure; soft; pH 7.0	0 to 5 inches; pale brown coarse sandy loam; weak granular structure; soft; pH 7.0	0 to 5 inches; yellowish brown fine sandy loam; moderate granular structure in top inch, moderate subangular blocky structure below; slightly hard; pH 7.0
Subsoil	7 to 15 inches; yellowish brown sandy loam; weak subangular blocky structure; hard; pH 6.5	5 to 13 inches; very pale brown coarse sandy loam; moderate subangular blocky structure; soft; pH 7.0.	5 to 28 inches; brown loam; moderate subangular blocky structure; hard and very hard; pH 6.5
Substratum	15 to 22 inches; brownish yellow gravelly sandy loam; massive; soft; pH 6.5 22 inches; highly weathered fractured metamorphic rock	13 inches; highly weathered granite	28 to 50 inches; brownish yellow fine sandy loam; moderate subangular blocky structure; very hard; pH 6.5 50 inches; highly weathered fractured granite

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 40	10 to 20	20 to 60
Available Water Capacity	Low	Very low	Moderate
Water Retention Class	2	3	1
Hydrologic Soil Group	B	C	C
Permeability	Moderately rapid	Moderately rapid	Moderately slow
Maximum Erosion Hazard	High	High	Moderate
Erosion Factor K	.16	.19	.26
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Group	II	II	II
Class	2Epg	3EPdg	2e
Soil Productivity	Moderate	Very low	Moderate
Forage Production Class	4	2	4
Forest Survey Site Class	NC	NC	NC
Chaparral Class	3	2	3

Included Areas and Remarks: Included in this unit are areas of soils of the Trigo family, Typic Xerorthents, warm, and Rock outcrop. Included areas make up 20 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant cover at or near the surface will help improve available water capacity.

SgF—Olete - Kilburn - Goulding families complex, 30 to 50 percent slopes

Elevation: 5,000 to 8,000 feet Annual Precipitation: 15 to 30 inches

Soil Map Unit Components	**Olete family**	**Kilburn family**	**Goulding family**
Approximate Proportion	30 percent	30 percent	15 percent
Landscape Position	Mountainsides that mainly have north to east aspects and foot slopes that have all aspects	Mountainsides that mainly have north to east aspects	Mountainsides that mainly have south to west aspects and side slopes
Slope	30 to 50 percent	30 to 50 percent	30 to 50 percent
Typical Vegetation Series	Pinyon pine or ponderosa/Jeffrey pine	Pinyon pine or ponderosa/Jeffrey pine	Pinyon pine, juniper, or ceanothus

Soil Profile Description

Surface Layer	0 to 3 inches; dark brown very cobbly fine sandy loam; massive; soft; pH 7.3	0 to 15 inches; brown and dark yellowish brown gravelly loam; weak granular structure; soft; pH 7.3	0 to 3 inches; brown gravelly loam; weak granular structure; slightly hard; pH 7.0
Subsoil	3 to 26 inches; yellowish brown very cobbly loam; weak subangular blocky structure; slightly hard; pH 7.0	15 to 30 inches; light yellowish brown very gravelly loam; massive; soft; pH 6.5	3 to 12 inches; yellowish brown very gravelly loam; weak subangular blocky structure; hard; pH 6.5
Substratum	26 inches; highly fractured gneiss	30 to 35 inches; yellowish brown very gravelly loam; massive; slightly hard; pH 6.5 35 inches; hard fractured schist	12 inches; hard, slightly weathered gneiss

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 40	20 to 40	10 to 20
Available Water Capacity	Very low	Low	Very low
Water Retention Class	2	2	3
Hydrologic Soil Group	B	B	C
Permeability	Moderate	Moderate	Moderately rapid
Maximum Erosion Hazard	High	High	High
Erosion Factor K	.17	.16	.16
Drainage Class	Well drained	Well drained	Well drained
Soil Manageability Group	IV	IV	IV
Class	3Epg	3Epg	3EPXdg
Soil Productivity	Low	Moderate	Low
Forage Production Class	4	4	2
Forest Survey Site Class	6-7	6-7	7
Chaparral Class	NA	NA	3

Included Areas and Remarks: Included in this unit are Rock outcrop (associated with the Goulding family), soils of the Hodgson family on old terrace remnants (pavement plains), and soils above 8,000 feet that have a mean annual soil temperature of less than 47 degrees F. Included areas make up 25 percent of the unit.

SgG—Olete - Goulding families - Rubble land association, 50 to 100 percent slopes

Elevation: 5,500 to 8,000 feet Annual Precipitation: 20 to 30 inches

Soil Map Unit Components	**Olete family**	**Goulding family**	**Rubble land**
Approximate Proportion	35 percent	25 percent	15 percent
Landscape Position	Mountainsides that mainly have north to east aspects and foot slopes	Mountainsides that mainly have south to west aspects and narrow ridges	Colluvial areas of mountainsides
Slope	50 to 65 percent	50 to 75 percent	70 to 100 percent
Typical Vegetation Series	Pinyon pine or ponderosa/Jeffrey pine	Pinyon pine or ponderosa/Jeffrey pine	Barren

Soil Profile Description

Surface Layer	0 to 3 inches; dark brown very cobbly fine sandy loam; massive; soft; pH 7.3	0 to 3 inches; brown gravelly loam; weak granular structure; slightly hard; pH 7.0	Rubble land consists of areas of detached rock fragments that have accumulated on very steep to extremely steep mountainsides as talus shoots. These areas support little or no vegetation and are subject to frequent landslides
Subsoil	3 to 26 inches; yellowish brown very cobbly loam; weak subangular blocky structure; slightly hard; pH 7.0	3 to 12 inches; yellowish brown very gravelly loam; weak subangular blocky structure; hard; pH 6.5	
Substratum	26 inches; highly fractured gneiss	12 inches; hard, slightly weathered gneiss	

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 40	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	2	3
Hydrologic Soil Group	B	C
Permeability	Moderate	Moderately rapid
Maximum Erosion Hazard	Very high	Very high
Erosion Factor K	.17	.16
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	IV	IV
Class	4EGp	4EPGxd
Soil Productivity	Low	Low
Forage Production Class	NC	NC
Forest Survey Site Class	6-7	7
Chaparral Class	NA	3

Included Areas and Remarks: Included in this unit are areas of Rock outcrop (associated with the Goulding family), soils of the Kilburn family (associated with the Olete family), soils of the Hodgson family on old terrace remnants (pavement plains), soils above 8,000 feet that have a mean annual temperature of less than 47 degrees F., soils of the Springdale family, and Lithic Xerorthents. Included areas make up 25 percent of the unit. The soils in this unit have a high potential for movement due to dry ravel if the protective cover is removed.

SoDE—Oak Glen - Morical, very deep families complex, 2 to 30 percent slopes

Elevation: 4,000 to 5,600 feet Annual Precipitation: 25 to 30 inches

Soil Map Unit Components	**Oak Glen family**	**Morical family, very deep**
Approximate Proportion	60 percent	20 percent
Landscape Position	Alluvial fans and terraces	Alluvial fans and terraces
Slope	2 to 30 percent	2 to 30 percent
Typical Vegetation Series	Coulter pine or canyon live oak (San Bernardino Mts.); ponderosa/Jeffrey pine (San Jacinto Mts.)	Coulter pine or canyon live oak (San Bernardino Mts.); ponderosa/Jeffrey pine (San Jacinto Mts.)

Soil Profile Description

Surface Layer	0 to 15 inches; dark grayish brown sandy loam; massive; soft; pH 7.0	0 to 6 inches; brown gravelly loam; weak granular structure; hard; pH 6.7
Subsoil	15 to 30 inches; dark grayish brown sandy loam; massive; soft; pH 6.8	6 to 36 inches; reddish yellow gravelly sandy clay loam; moderate subangular blocky structure; very hard; pH 6.7
Substratum	30 to 60 inches; grayish brown sandy loam; massive; slightly hard; pH 6.8 60 inches; mixed alluvium	36 to 60 inches; light brown sandy loam; massive; slightly hard; pH 7.0 60 inches; mixed alluvium or slightly consolidated alluvium

Soil Properties & Management Interpretations

Effective Rooting Depth	60	60
Available Water Capacity	Moderate	Moderate
Water Retention Class	2	1
Hydrologic Soil Group	B	B
Permeability	Moderately rapid	Moderately slow
Maximum Erosion Hazard	Moderate	Moderate
Erosion Factor K	.17	.17
Drainage Class	Well drained	Well drained
Soil Manageability		
Group	II	II
Class	2ep	2e
Soil Productivity	Moderate	Moderate
Forage Production Class	5	6
Forest Survey Site Class	5-6	5-6
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of soils of the Ruch family and Avawatz family in drainageways. Included areas make up 20 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant cover at or near the surface will help improve available water capacity.

ToDF—Ruch family - Typic Xerorthents association, 2 to 50 percent slopes

Elevation: 3,800 to 6,600 feet Annual Precipitation: 20 to 30 inches

Soil Map Unit Components	**Ruch family**	**Typic Xerorthents**
Approximate Proportion	50 percent	25 percent
Landscape Position	Incised terraces	Terrace escarpments
Slope	2 to 25 percent	25 to 50 percent
Typical Vegetation Series	Ceanothus or chamise (some Coulter pine)	Ceanothus, chamise, or manzanita

Soil Profile Description

Surface Layer	0 to 9 inches; pale brown loam; weak granular structure; soft; pH 6.2	These soils are loamy sand and are 20 to 70 percent rock fragments. Mean annual soil temperature is 47 to 59 degrees F.
Subsoil	9 to 23 inches; light yellowish brown loam; moderate subangular blocky structure; slightly hard; pH 6.6 23 to 32 inches; yellowish brown sandy loam; massive; slightly hard; pH 6.6	
Substratum	32 to 60 inches; light yellowish brown gravelly loamy sand; massive; slightly hard; pH 6.6 60 inches; mixed alluvium.	

Soil Properties & Management Interpretations

Effective Rooting Depth	60	60
Available Water Capacity	Moderate	Very low to low
Water Retention Class	1	2-3
Hydrologic Soil Group	B	A
Permeability	Moderately slow	Moderately rapid to very rapid
Maximum Erosion Hazard	Moderate	High or very high
Erosion Factor K	.23	
Drainage Class	Well drained	Somewhat excessively drained and excessively drained
Soil Manageability		
Group	II	II
Class	2e	3Ep-3EPg
Soil Productivity	High	Very low
Forage Production Class	6	2-4
Forest Survey Site Class	5-6	NA
Chaparral Class	4	2

Included Areas and Remarks: Included in this unit are soils of the Oak Glen family (associated with Ruch family), soils of the Brader family that are underlain by sandstone, and soils below 4,000 feet that have a mean annual soil temperature of more than 59 degrees F. Included areas make up 25 percent of the unit. Erosion can be controlled by leaving adequate cover on the surface. Maintaining plant cover at or near the surface will help improve available water capacity.

TyG—Tollhouse - Olete - Tyee families complex, 50 to 75 percent slopes

Elevation: 4,000 to 5,200 feet Annual Precipitation: 20 to 25 inches

Soil Map Unit Components	**Tollhouse family**	**Olete family**	**Tyee family**
Approximate Proportion	30 percent	25 percent	25 percent
Landscape Position	Mountainsides	Mountainsides that mainly have north to east aspects and foot slopes of hills	Mountainsides
Slope	50 to 75 percent	50 to 65 percent	50 to 75 percent
Typical Vegetation Series	Chamise or ceanothus	Chamise, ceanothus, or big cone Douglas fir	Chamise or ceanothus

Soil Profile Description

Surface Layer	0 to 11 inches; very dark grayish brown gravelly sandy loam; weak granular structure; soft; pH 7.0	0 to 3 inches; dark brown very cobbly fine sandy loam; massive; soft; pH 7.3	0 to 4 inches; dark brown gravelly sandy loam; weak subangular blocky structure; soft; pH 7.0
Subsoil	11 to 18 inches; dark grayish brown sandy loam; massive; soft; pH 7.0	3 to 25 inches; yellowish brown very cobbly loam; weak subangular blocky structure; slightly hard; pH 7.0	4 to 11 inches; light yellowish brown sandy loam; massive; soft; pH 7.0
Substratum	18 inches; highly weathered granite	25 inches; highly fractured gneiss	11 to 15 inches; light yellowish brown coarse sandy loam; massive; soft; pH 6.5 15 inches; highly weathered granite

Soil Properties & Management Interpretations

Effective Rooting Depth	10 to 20	20 to 40	10 to 20
Available Water Capacity	Very low	Very low	Very low
Water Retention Class	2	2	2
Hydrologic Soil Group	C	B	C
Permeability	Moderately rapid	Moderate	Moderately rapid
Maximum Erosion Hazard	Very high	Very high	Very high
Erosion Factor K	.14	.17	.21
Drainage Class	Somewhat excessively drained	Well drained	Somewhat excessively drained
Soil Manageability Group	IV	IV	IV
Class	4EGpd	4EGp	4EGpd
Soil Productivity	Low	Low	Low
Forage Production Class	NC	NC	NC
Forest Survey Site Class	NC	NC	NC
Chaparral Class	2	2	2

Included Areas and Remarks: Included in this unit are areas of Lithic Xerorthents, dry and soils of the Kilburn family (associated with Olete family). Included areas make up 20 percent of the unit. The soils in this unit have a high potential for movement due to dry ravel if the protective cover is removed.

WpF—Wapal - Corbett association, 30 to 50 percent slopes

Elevation: 7,000 to 9,500 feet Annual Precipitation: 30 to 40 inches

Soil Map Unit Components	**Wapal family**	**Corbett family**
Approximate Proportion	50 percent	25 percent
Landscape Position	Mountainsides	Mountainsides
Slope	30 to 50 percent	30 to 40 percent
Typical Vegetation Series	Lodgepole pine, white fir, or ponderosa/Jeffrey pine	Ponderosa/Jeffrey pine, white fir, or lodgepole pine

Soil Profile Description

Surface Layer	0 to 3 inches; light olive brown very gravelly sandy loam; weak granular structure; soft; pH 6.4	0 to 6 inches; dark grayish brown gravelly sandy loam; weak granular structure; soft; pH 7.0
Subsoil	3 to 27 inches; light yellowish brown very gravelly loamy sand; single grain; loose; pH 6.2	6 to 25 inches; pale brown and olive yellow gravelly loamy sand; massive and soft or single grain and loose; pH 6.5
Substratum	27 to 40 inches; light yellowish brown extremely gravelly loamy sand; single grain; loose; pH 6.3 40 inches; highly fractured granite	25 inches; highly weathered granite

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 60	20 to 40
Available Water Capacity	Very low	Very low
Water Retention Class	3	2
Hydrologic Soil Group	B	B
Permeability	Very rapid	Rapid
Maximum Erosion Hazard	High	High
Erosion Factor K	.10	.16
Drainage Class	Somewhat excessively drained	Somewhat excessively drained
Soil Manageability		
Group	III	III
Class	3EPg	3EPg
Soil Productivity	Low	Moderate
Forage Production Class	3	4
Forest Survey Site Class	7	6
Chaparral Class	NA	NA

Included Areas and Remarks: Included in this unit are areas of Rock outcrop, Lithic Xerorthents, cool (associated with Wapal family), and soils of the Merkel family. Included areas make up 25 percent of the unit.

WpG—Wapal - Lithic Xerorthents, cool association, 50 to 75 percent slopes

Elevation: 7,000 to 10,500 feet Annual Precipitation: 30 to 40 inches

Soil Map Unit Components	**Wapal family**	**Lithic Xerorthents, cool**
Approximate Proportion	50 percent	20 percent
Landscape Position	Mountainsides that mainly have north aspects, in colluvial areas and on foot slopes	Narrow ridges and mountainsides that mainly have south to west aspects
Slope	20 to 65 percent	60 to 75 percent
Typical Vegetation Series	Lodgepole pine, white fir, or ponderosa/Jeffrey pine	Ponderosa/Jeffrey pine, white fir, or lodgepole pine

Soil Profile Description

Surface Layer	0 to 3 inches; light olive brown very gravelly sandy loam; weak granular structure; soft; pH 6.4	Depth to hard rock is 10 to 20 inches. The profile is loam, sandy loam, or loamy sand and is 35 to 80 percent rock fragments. Mean annual soil temperature is 40 to 47 degrees F.
Subsoil	3 to 27 inches; light yellowish brown very gravelly loamy sand; single grain; loose; pH 6.2	
Substratum	27 to 40 inches; light yellowish brown extremely gravelly loamy sand; single grain; loose; pH 6.3 40 inches; highly fractured granite.	

Soil Properties & Management Interpretations

Effective Rooting Depth	20 to 60	10 to 20
Available Water Capacity	Very low	Very low
Water Retention Class	3	3
Hydrologic Soil Group	B	C
Permeability	Very rapid	Moderately rapid to very rapid
Maximum Erosion Hazard	High	Very high
Erosion Factor K	.10	
Drainage Class	Somewhat excessively drained	Somewhat excessively drained or excessively drained
Soil Manageability Group	IV	IV
Class	4EPG	4EPGXd
Soil Productivity	Low	Very low
Forage Production Class	NC	NC
Forest Survey Site Class	7	NC
Chaparral Class	NA	NA
Included Areas and Remarks:	Included in this unit are areas of Rubble land, Rock outcrop (associated with Lithic Xerorthents, cool), soils of the Corbett family, and soils of the Merkel family with slopes of 40 to 55 percent. Included areas make up 30 percent of the unit. The soils in this unit have a high potential for movement due to dry ravel if the protective cover is removed.	

TABLE 2. - Acreage and Proportionate Extent of the Map Units

Map Symbol	Map Unit Name	Percent of Survey Area	Acres
AbD	Soboba - Hanford families association, 2 to 15 percent slopes	1.4	11,570
AeD	Oak Glen family - Riverwash association, 2 to 30 percent slopes	0.1	940
BeDE	Wrightwood - Morical, dry families association, 2 to 30 percent slopes	0.9	7,300
BeF	Morical, dry - Wrightwood families association, 30 to 50 percent slopes	0.4	3,030
BgEF	Morical family, dry - Badland association, 15 to 50 percent slopes	0.3	2,790
BoD	Morical, very deep - Hecker families complex, 2 to 15 percent slopes	1.2	9,820
BoE	Morical, very deep - Hecker families complex, 15 to 30 percent slopes	1.2	9,690
BoF	Hecker - Morical, very deep families complex, 30 to 50 percent slopes	0.3	2,390
CaD	Cagey family - Riverwash association, 2 to 15 percent slopes	0.3	2,120
ChDE	Ramona family - Typic Xerorthents, warm association, 2 to 30 percent slopes	0.5	3,805
ChFG	Typic Xerorthents, warm - Typic Haploxeralfs - Badlands complex,30 to 100 percent slopes	2.1	17,190
CmE	Modesto - Osito families association, 15 to 30 percent slopes	1.2	9,655
CmF	Osito - Modesto families association, 30 to 50 percent slopes	1.9	15,660
CoDE	Corbett - Wapal families association, 2 to 30 percent slopes	0.3	2,640
DaE	Pacifico - Wapi families complex, 15 to 30 percent slopes	1.3	10,835
DaF	Pacifico - Wapi families complex, 30 to 50 percent slopes	2.8	22,855

TABLE 2. - Acreage and Proportionate Extent of the Map Units (continued)

Map Symbol	Map Unit Name	Percent of Survey Area	Acres
DaG	Wapi - Pacifico families-Rock outcrop complex, 50 to 75 percent slopes	2.9	23,250
DcDE	Morical - Brader families association, 2 to 30 percent slopes	0.4	3,455
DcF	Brader - Morical families association, 30 to 50 percent slopes	0.3	2,780
DdDE	Pacifico - Preston families complex, 2 to 30 percent slopes	1.7	13,865
DdF	Pacifico - Preston families complex, 30 to 50 percent slopes	1.8	14,710
DeF	Tyee - Tollhouse families complex, 30 to 50 percent slopes	0.1	850
DhG	Lithic Xerorthents - Springdale family - Rubble land association, 50 to 100 percent slopes	3.2	26,185
DnE	Trigo family - Lithic Xerorthents, warm complex, 15 to 30 percent slopes	1.7	13,655
DnF	Trigo family - Lithic Xerorthents, warm complex, 30 to 50 percent slopes	2.1	17,045
DnG	Trigo family - Lithic Xerorthents, warm complex, 50 to 75 percent slopes	9.2	74,745
DpF	Lithic Xerorthents, warm - Rock outcrop complex, 30 to 50 percent slopes	0.8	6,360
DpG	Lithic Xerorthents, warm - Rock outcrop complex, 50 to 100 percent slopes	3.3	27,090
DxE	Wapi - Pacifico families, dry - Rock outcrop complex, 15 to 30 percent slopes	2.6	20,870
DxF	Wapi - Pacifico families, dry - Rock outcrop complex, 30 to 50 percent slopes	3.5	28,450
DxG	Wapi - Pacifico families, dry - Rock outcrop complex, 50 to 75 percent slopes	3.6	29,345
EsD	Riverwash - Soboba families association, 2 to 15 percent slopes	0.6	4,505

TABLE 2. - Acreage and Proportionate Extent of the Map Units **(continued)**

Map Symbol	Map Unit Name	Percent of Survey Area	Acres
FaE	Olete - Goulding families association, 15 to 30 percent slopes	1.5	12,105
FaF	Olete - Goulding families association, 30 to 50 percent slopes	1.7	13,990
FbE	Merkel - Switchback families complex, 15 to 30 percent slopes	0.8	6,845
FbF	Merkel - Wapal families complex, 30 to 50 percent slopes	0.8	6,675
FhG	Springdale - Winthrop families complex, 50 to 75 percent slopes	1.1	9,120
FLG	Springdale family - Lithic Xerorthents association, dry, 50 to 75 percent slopes	4.0	32,330
FrE	Lizzant family - Lithic Xerorthents, calcareous association, 15 to 30 percent slopes	0.2	1,505
FrF	Lithic Xerorthents, calcareous - Lizzant family association, 30 to 50 percent slopes	0.6	5,185
FsD	Wilshire - Oak Glen, dry families association, 2 to 15 percent slopes	1.3	10,725
G	Badland	0.4	3,460
GrEF	Green Bluff - Brader families association, 15 to 50 percent slopes	0.4	3,040
HoD	Morical, very deep - Hodgson families association, 2 to 15 percent slopes	0.5	4,215
HoE	Morical, very deep - Hodgson families association, 15 to 30 percent slopes	0.3	2,125
JoG	Springdale, dry - Olete families complex, 50 to 75 percent slopes	0.9	7,615
JrG	Lithic Xerorthents, dry - Springdale family, dry - Rubble land association, 50 to 100 percent slopes	0.2	1,570
KoD	Wind River - Oak Glen families association, 2 to 15 percent slopes	0.8	6,060

TABLE 2. - Acreage and Proportionate Extent of the Map Units (continued)

Map Symbol	Map Unit Name	Percent of Survey Area	Acres
LcF	Lithic Xerorthents, calcareous - Rock outcrop complex, 30 to 50 percent slopes	0.4	3,280
LcG	Lithic Xerorthents, calcareous - Rock outcrop complex, 50 to 100 percent slopes	1.0	8,225
LdG	Lithic Xerorthents, cool - Rock outcrop complex, 50 to 100 percent slopes	2.5	20,035
LrG	Lithic Xerorthents - Rock outcrop complex, 50 to 100 percent slopes	3.5	28,070
MbE	Morical - Wind River families complex, 15 to 30 percent slopes	1.8	14,585
MbF	Morical - Wind River families complex, 30 to 50 percent slopes	1.8	14,710
MoFG	Typic Xerorthents - Morical family, dry association, 30 to 75 percent slopes	0.8	6,530
OmD	Oak Glen - Ruch families complex, 2 to 15 percent slopes	1.0	8,125
PsD	Avawatz - Oak Glen, dry families association, 2 to 15 percent slopes	1.2	10,025
RLG	Rubble land - Lithic Xerorthents association, 50 to 100 percent slopes	1.7	13,685
Rs	Rock outcrop, 30 to 100 percent slopes	5.2	42,075
Ru	Rubble land - Rock outcrop complex, 50 to 100 percent slopes	0.7	5,900
Rw	Riverwash	0.5	3,805
SaEF	San Andreas - Osito - Modesto families complex, 15 to 50 percent slopes	0.6	4,650
SgF	Olete - Kilburn - Goulding families complex, 30 to 50 percent slopes	0.8	6,075
SgG	Olete - Goulding families - Rubble land association, 50 to 100 percent slopes	2.0	15,880

TABLE 2. - Acreage and Proportionate Extent of the Map Units **(continued)**

Map Symbol	Map Unit Name	Percent of Survey Area	Acres
SoDE	Oak Glen - Morical, very deep families complex, 2 to 30 percent slopes	0.3	2,180
ToDF	Ruch family - Typic Xerorthents association, 2 to 50 percent slopes	0.8	6,810
TyG	Tollhouse - Olete - Tyee families complex, 50 to 75 percent slopes	0.3	2,780
WpF	Wapal - Corbett families association, 30 to 50 percent slopes	0.5	4,575
WpG	Wapal family - Lithic Xerorthents, cool association, 50 to 75 percent slopes	2.2	17,585
	Water Areas	0.9	7,310
		100	812,910

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land use allocations to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land use.

Information in this section can provide a basis for assigning management priorities to land areas with fewer or less severe limitations and for determining areas where more detailed or site-specific soil survey information is needed.

Additional information about each soil and its use and management is given under "Detailed Soil Map Units" In that section, individual soils are evaluated for their productivity, their manageability limitations, and their potential for production of forage and timber.

Watershed

The forest supplies approximately 25 percent of the water demand in the locality. Because of the tremendous amount of fracturing throughout the rock mass, these rocks have considerable capacity for reception and temporary storage of water. The degree of fracturing and the associated deep weathering in the underlying rock mantles are important factors in determining the hydrologic response of these watersheds.

Annual water production in the forest area is estimated to be about 223,000 acre-feet. Water that percolates through the thin soil mantles becomes part of the ground-water system. At the beginning of the rainy season, when these shallow soils are dry and undisturbed, they normally have high infiltration rates. Because of the degree of fracturing and deep weathering in the underlying bedrock, these soils have more permeable substratums than other shallow soils. For watershed planning purposes, these soils were assigned a hydrologic soil group rating of moderately high runoff rather than high runoff potential.

Soils in the forest area are managed for watershed protection by preventing soil erosion and maintaining productivity. Overland flow or runoff on these shallow forest soils can increase tremendously as a result of wildfires on chaparral lands, which lead to the formation of water-repellent (hydrophobic) soil layers. Prevention of large wildfires through more intensive management of vegetation is an important objective of soil management. Fuelbreak construction and the use of prescribed burning of chaparral to develop age-class mosaics are important tools for reducing soil erosion and sedimentation rates resulting from large wildfires.

Rangeland

Forage for domestic livestock and feral burros is produced from all vegetation types at elevations from 1,600 to 8,500 feet. Transitory range, such as fuelbreaks and type conversions, produces approximately half of the total forage that is currently produced on 15 range allotments and one burro territory.

Rangeland in the San Bernardino National Forest is land on which the predominant vegetation is forage plants such as grasses, grasslike plants, forbs, and shrubs. It includes land where the climax vegetation either is in early successional stages or has been replaced naturally or artificially but is managed like native vegetation. Annual plants dominate the herbaceous cover and occur with varying amounts of bunchgrass and seeded perennial grasses.

Suitability of the forest's rangeland for livestock grazing is determined by factors such as percent of canopy overstory (especially dense chaparral), slope gradient, available water, and soil productivity. Capacity of suitable forest rangeland is determined by the amount of annual precipitation and of effective ground cover (residual dry matter or mulch) after grazing. The effectiveness of ground cover depends on soil type, the basal area of all plant cover, dry plant residue that effectively protects the soil from raindrop impact, rock fragments on the soil surface, and the amount of bare soil that does not have protection from impact.

In recent years the demand for use of forest soils for forage production has increased substantially. Currently under grazing permit the forest produces about 12,100 animal-unit-months of grazing. (An animal-unit-month is the amount of forage required to feed one animal unit - one cow, one horse, one mule, five, sheep, or five goats - for 30 days.) There are additional areas capable of range forage production; however, these lands need prescribed fire treatments and water development to be suitable for commercial grazing. Most forage produced and eaten by livestock will be annual grasses, forbs, and resprouting chaparral species. Maximum production of annual grasses occurs in winter and spring.

Soil properties that affect moisture supply and plant nutrients have the greatest influence on productivity of range plants. The most productive range soils are usually those that have high available water capacities and are in higher rainfall zones. The moderately deep and deep upland soils like the San Andreas and Oak Glen families are in this category. In general, the least productive soils are those shallow, coarse textured soils that occur at elevations below 4,500 feet and particularly on south- or west-facing slopes. Deep colluvial soils or soils on north-facing slopes have moisture regimes that favor the buildup of organic matter and therefore have better fertility. However, slope is a major limitation of these colluvial soils for range use.

Proper forage utilization should ensure enough cover to protect the soil and maintain and improve site productivity. Adequate ground cover should include litter and duff deposits from previous years. Other practices that facilitate proper grazing are fencing, distribution of water for livestock, location of salt blocks, and supplemental feeding.

Timber and Woodlands

The San Bernardino National Forest has approximately 119,260 acres of land that is physically capable of producing wood products in excess of 20 cubic feet per acre per year. Of these 119,260 acres of commercial forest land, about 78,000 acres are economically impractical to harvest because of rockiness, steep slopes, and difficult terrain or have limited access into the area. Most of the timber produced from the forest is sold for use as firewood, and limited amounts are sold as sawtimber. The forest produces about 28,330 cords of wood annually from a variety of sources, including wood produced from precommercial thinning activities, sawtimber logging residue, fire-killed trees, insect-damaged and diseased trees, and noncommercial wood sources such as hardwoods and large brush species. Demand for firewood has increased significantly relative to sawtimber demand in the past few years and now exceeds the capacity of the forest to produce firewood. Commercial and noncommercial areas that are available for firewood gathering and timber sales have the potential of being overutilized, and precautions must be taken to protect the soils from compaction and erosion resulting from these activities.

The demand for conifer and hardwood trees is especially high in developed and dispersed recreation sites for esthetic reasons and in wildlife habitats that are critical for a number of wildlife species. Tree plantations have been established throughout the forest in many vegetation types. Emphasis is placed on converting brush stands in suitable locations to trees and on increasing inadequate stocking levels of timber stands to a level within the capabilities of the site. The best sites for regeneration planting are generally at elevations above 4,500 feet and receive annual rainfall in excess of 20 inches. Deep alluvial and residual soils with moderate to high water-holding capacity and situated on north and east aspects at these higher elevations are the most suitable sites for regeneration of an ecologically adapted species. The best sites include Morical and Morical, very deep soils and soils of the Hecker, Oak Glen, Ruch, and Wind River families. As with forage production, moisture stress is the major limiting factor for tree growth.

The desired forest structure is uneven-age with diversity in size classes and species. The forest is managed under the broad silvicultural system known as selection management. The principal stand treatment is controlling stocking levels during all stages of stand growth and development. Stocking is adjusted to levels commensurate with the capacity of the site to produce and maintain a healthy, vigorous forest. Integrated pest management is an integral part of all forest management activities.

The vegetation types that make up the forest are as follows:

Oak Woodland. This type occurs in limited areas above the chaparral zone on south exposures, but can also be found as inclusions within the chaparral zone. Oak woodland is dominated by canyon live oak averaging about 30 feet in height. Mature stands form a dense overhead canopy and are nearly devoid of undergrowth. Dispersed within the oak woodland zone are scattered stands of bigcone Douglas-fir, a conifer species adapted to a low-moisture environment. Bigcone Douglas-fir is usually found growing in canyon bottoms on south- and west-facing slopes and in groups on north-facing slopes.

Coniferous Forest. In southern California, adequate precipitation to support most coniferous tree species occurs above 4,500 feet. Beginning at about this level is found a marginal forest of Coulter pine, commonly composed of open stands with a woodland oak or brush understory. As elevation increases, Coulter pine gives way to the main body of the coniferous forest. Within this zone, coniferous species dominate the landscape in various mixtures determined by elevation, precipitation, and aspect. Three main subdivisions of the coniferous forest and one woodland type are described as follows.

Pine Forest. A widespread type occurring in all southern California National Forests. Usually located at altitudes from 4,500 to 8,000 feet, the pine forest is found on fans and terraces, ridge tops, or southern exposures of hills and mountainsides. Pine forests are usually open, but where soils are deep, may be quite dense. Jeffrey and

ponderosa pines are the dominant species, with Jeffrey generally growing above 6,000 feet, and ponderosa below this altitude. California black oak (*Quercus kelloggii*) is commonly present in stands below about 7,000 feet, in many places forming an attractive conifer-oak type. In some lower rainfall zones, substantial areas of Jeffrey pines in nearly pure stands mix with a well established understory of mountain mahogany which competes for space and water with Jeffrey pine seedlings.

Mixed Conifer Forest. On the moister sites, a fairly dense forest composed of a mixture of several conifer species occurs. Jeffrey, ponderosa, and sugar pines, white fir, incense-cedar, and black oak grow together in stands resembling those in the Sierra Nevada. The species mix varies with environmental conditions, but is generally strongly weighted to ponderosa pine at lower elevations and south slopes, and to white fir at the upper elevational limits of this type. Occasionally, mixtures of all species may be found.

High Elevation or Sub-Alpine Forest. This type emerges from the intermediate pine or mixed conifer forests at elevations above 8,000 feet. Fewer conifer species are adapted to the cold climate and short growing season in this zone, but lodgepole pine is common and often forms dense stands. Limber pine (*pinus flexilis*) sometimes occurs on the highest peaks and ridges. Limber pine often forms pure, sparse stands at elevations between about 9,000 and 10,500 feet. Their dwarfed and sculptured crowns reflect the severe environment of wind, snow, and ice.

Pinyon-Juniper Woodland. Below the coniferous forest on desert-facing slopes occurs a distinctive plant community composed primarily of pinyon pine with juniper an important component. Interspersed with these conifers are mountain mahogany, desert scrub oak, Great Basin sagebrush, and other xerophytic (dry habitat) plants.

Wildlife Habitat

The fish and wildlife resources of the San Bernardino National Forest are extremely important to the people of southern California and the nation. Fish and wildlife provide numerous opportunities for consumptive and nonconsumptive forms of recreation as well as serve as an indicator of ecosystem health. Fishing and other wildlife-related activities such as hunting, bird watching, nature study, and photography have an effect on the area's economy. Many species of wildlife in the forest help in the natural control of weeds, insects, and animal pests.

The forest has one of the most diverse fish and wildlife resources in the nation, as it includes desert, coastal, and mountain-associated habitats. Many species have the northern or southern boundaries of their range in the forest.

Numerous species have been extirpated from the forest largely through human influence, among them the grizzly bear, wolverine, and peregrine falcon. Many other species have declined significantly in southern California, so that the forest is becoming more and more critical to their survival.

Soils are extremely important to the fish and wildlife resources in the San Bernardino National Forest. Soil productivity greatly influences the productivity of the vegetation available for wildlife, which in turn largely determines the productivity of the wildlife resource. Many of the most productive areas in the forest are also the most heavily impacted by man in the form of development, off-highway vehicle use, and intensive recreational use. Protecting natural areas with high productive potential is extremely critical if adequate populations of deer, bear, mountain lions, and various raptors are to be maintained in viable numbers.

Soil characteristics themselves are very important to a variety of species. Friable soils are critical to burrowing rodents, and well aerated soils are essential for a number of reptiles and amphibians. Soil moisture is necessary for the survival of many amphibians, reptiles, and other species.

Soil erodibility and the hazard of erosion are important factors for both terrestrial and aquatic wildlife species. Increased sediment resulting from human activities and accompanying erosion can severely impair the productivity of aquatic habitats. This effect is especially critical in this forest in streams supporting wild (self-sustaining) populations of trout.

Recreation

The San Bernardino National Forest is the most heavily used national forest in the Pacific Southwest Region because of its proximity to the major population centers of southern California. Population is expected to continue to grow and demand for recreation to increase. The forest provides many different uses, from wilderness hiking to alpine skiing. Developed recreation includes campgrounds, picnic areas, ski areas, organization sites, recreation residences, resorts, etc. Dispersed recreation includes using off-highway vehicles, hiking, hunting, fishing, driving for pleasure, and remote camping.

The following is a general discussion of soil characteristics important for some kinds of recreational sites.

Campsites and picnic grounds require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. These areas are subject to heavy foot traffic and some vehicular traffic. The best soils have gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Steeper slopes and the presence of stones or boulders can greatly increase the cost of constructing campsites. Where flush toilets are to be installed, soil suitability for septic fields is an important factor. Overuse and heavy foot traffic may cause such severe soil compaction and reduced infiltration that it becomes necessary to close the campground for restoration.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding. They have moderate slopes and few or no stones or boulders on the surface.

Ski areas require flat or gentle slopes for base facilities next to a variety of slopes suitable for ski runs of different skill levels. Trees and brush will be removed from slopes to create ski runs or provide room for ski lifts. Slopes may be modified and groomed for safety. Areas need to have a northern exposure, sufficient elevation, and suitable temperature for natural snowfall and artificial snow making. The best soils are suitable for type conversion to grasses or shrublike herbaceous species or both and are resistant to erosion from surface runoff when not covered with a protective snow layer.

Recreational use of off-highway vehicles (trail bikes, 4-wheel jeeps, etc.) in the forest can cause major impact on soil resources where use is not confined to roads or trails. Terrain should have gentle to moderate slopes. The best soils are not wet, are firm after rains and not dusty when dry, and are not subject to flooding.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 3, the soils of the survey area are listed alphabetically and are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in sol. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth, or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Xeralf (Xer, meaning dry, plus alf, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haploxeralf (Hapl, meaning minimal horizonation, plus xeralf, the suborder of the Alfisols that have a xeric moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective Mollic identifies the subgroup that has a dark colored surface layer high in organic matter, which is not both massive and hard or very hard when dry. An example is Mollic Haploxeralfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the rooting zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Mollic Haploxeralfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

TABLE 3. - Classification of the Soils

SOIL NAME	FAMILY OR HIGHER TAXONOMIC CLASS
Avawatz family	Sandy, mixed, mesic Mollic Xerofluvents
Brader family	Loamy, mixed, mesic, shallow Typic Xerocherpts
Cagey family	Mixed, mesic Aquic Xeropsamments
Corbett family	Mixed, frigid Typic Xeropsamments
Goulding family	Loamy-skeletal, mixed, mesic Lithic Xerocherpts
Green Bluff family	Coarse-loamy, mixed, mesic Typic Xerocherpts
Hanford family	Coarse-loamy, mixed, nonacid, thermic Typic Xerorthents
Hecker family	Loamy-skeletal, mixed, mesic Mollic Haploxeralfs
Hodgson family	Fine, mixed, mesic Typic Palexeralfs
Kilburn family	Loamy-skeletal, mixed, mesic Typic Haploxerolls
Lithic Xerorthents	Lithic Xerorthents
Lizzant family	Loamy-skeletal, carbonatic, frigid Typic Calcixerolls
Merkel family	Loamy-skeletal, mixed, frigid Typic Xerocherpts
Modesto family	Fine-loamy, mixed, thermic Mollic Haploxeralfs
Morical family	Fine-loamy, mixed, mesic Mollic Haploxeralfs
Oak Glen family	Coarse-loamy, mixed, mesic Pachic Haploxerolls
Olete family	Loamy-skeletal, mixed, mesic Typic Xerocherpts
Osito family	Loamy, mixed, thermic, shallow Typic Xerocherpts
Pacifico family	Mixed, mesic, shallow Typic Xeropsamments
Preston family	Mixed, mesic Typic Xeropsamments
Ramona family	Fine-loamy, mixed, thermic Typic Haploxeralfs
Ruch family	Fine-loamy, mixed, mesic Typic Haploxeralfs
San Andreas	Coarse-loamy, mixed, thermic Typic Haploxerolls
Soboba family	Sandy-skeletal, mixed, thermic Typic Xerofluvents
Springdale family	Sandy-skeletal, mixed, mesic Typic Xerorthents
Switchback family	Coarse-loamy, mixed, frigid Typic Xerochrepts
Tollhouse family	Loamy, mixed, mesic, shallow Entic Haploxerolls

TABLE 3. - Classification of the Soils

SOIL NAME	FAMILY OR HIGHER TAXONOMIC CLASS
Trigo family	Loamy, mixed, nonacid, thermic,shallow Typic Xerorthents
Tyee family	Loamy, mixed, nonacid, mesic, shallow Typic Xerorthents
Typic Haploxeralfs	Typic Haploxeralfs
Typic Xerorthents	Typic Xerorthents
Wapal family	Sandy-skeletal, mixed, frigid Typic Xerorthents
Wapi family	Mixed, mesic Lithic Xeropsamments
Wilshire family	Sandy-skeletal, mixed, mesic Typic Xerofluvents
Wind River family	Coarse-loamy, mixed, mesic Ultic Haploxerolls
Winthrop family	Sandy-skeletal, mixed, mesic Entic Haploxerolls
Wrightwood family	Coarse-loamy, mixed, mesic Typic Haploxeralfs

Four soil orders are represented in the San Bernardino National Forest Survey Area: Alfisols, Entisols, Inceptisols, and Mollisols.

The soils in the survey area have a xeric moisture regime and mesic, frigid, or thermic temperature regimes. The xeric moisture regime is that typified in the Mediterranean climate, where winters are moist and cool and summers are warm and dry. Therefore, unless the soil is irrigated, the moisture control section is dry in all parts for 45 consecutive days or more in the period July to October in 6 out of 10 years. The moisture control section is moist in all parts for 45 consecutive days or more in the period December to May.

Temperature regime is thermic at the lower elevations and particularly on south-facing aspects. The thermic temperature regime is one in which the soil temperature at a depth of 20 inches or at a lithic or paralithic contact, whichever is lower, ranges from 59 to 72 degrees F. At the higher elevations, the temperature regime is mesic. The mesic temperature regime is one in which the soil temperature at a depth of 20 inches or at a lithic or paralithic contact, whichever is lower, ranges from 47 to 59 degrees F. Frigid temperature regimes occur at the highest elevations and have soil temperatures that range between 32 and 47 degrees F at a depth of 20 inches or at a lithic or paralithic contact, whichever is lower.

The four soil orders recognized in the San Bernardino National Forest and the great groups and subgroups that are represented in the survey area are described in the following paragraphs.

Alfisols are soils that have been in place for a sufficient length of time for silica clay to move downward and accumulate. They are characterized by massive and hard surface layers and argillic horizons that have moderate to high base saturation. Two great groups of Alfisols that have one to two subgroups are recognized in the survey area.

The Haploxeralfs are well drained soils that are dry to a depth of at least 20 inches because of the climate. Two subgroups of Haploxeralfs are recognized in the survey area. The Typic Haploxeralfs are well drained soils that are low in organic matter content. Ramona, Ruch, and Wrightwood families are placed in this subgroup. Mollic Haploxeralfs are well drained and have higher levels of organic matter. Hecker, Modesto, and Morical families are placed in this subgroup. The Typic Palexeralfs, the only subgroup of Palexeralfs in the area, are well drained, very deep soils that have an argillic horizon with an abrupt upper boundary. Hodgson soils are in this subgroup.

Entisols are recent soils that show little or no evidence of horizon development except that some soils may have weakly developed surface horizons. Three great groups of Entisols having two to three subgroups are recognized in the survey area.

The Xerorthents are well drained and excessively drained soils that have a xeric moisture regime. Most of these soils are on sloping, recent erosional land surfaces, and water is lost through runoff. These soils have been leached sufficiently to remove all the salts from the upper parts of the profile. The Typic Xerorthents are not saturated with water at a depth of less than 60 inches at any time of the year. They are very deep to shallow and occur over soft or hard bedrock and alluvium. Soils of the Hanford, Springdale, Trigo, Tyee, and Wapel families are placed in the subgroup of Typic Xerorthents. Lithic Xerorthents are like Typic Xerorthents except that they are shallow to hard rock. Depth to hard granitic or metamorphic rock or limestone ranges from 10 to 20 inches. No families are placed in this subgroup; however, the calcareous, cool, dry, and warm phases are recognized in the survey area.

The Xerofluvents formed in recent water-deposited sediment in such areas as flood plains, fans, and drainageways of rivers and small streams. Flooding is frequent unless the area is protected by dikes or levees. Stratification of the soil material is normal. Layers of a given texture tend to alternate with layers of other textures. Organic matter content decreases irregularly with increasing depth or remains more than 0.2 percent carbon to a depth of 50 inches. If the texture remains similar as depth increases, content of organic carbon decreases regularly with increasing depth. The proportion of carbon at increasing depth is higher than that in soils that formed in other parent material, because alluvial deposits are generally recent. Slopes are less than 15 percent, but other features such as texture and content of coarse fragments between depths of 10 and 40 inches and lack of wetness are the same for the Xerofluvents as they are for Xerorthents.

Two subgroups of the Xerofluvents are recognized in the survey area. The Typic Xerofluvents are somewhat excessively drained soils that in many places have strata of contrasting textures below the surface layer. Soboba and Wilshire soils are in this subgroup. Mollic Xerofluvents are like Typic Xerofluvents, but in addition they have a dark colored surface layer. Avawatz soils are in this subgroup.

The Xeropsamments are well sorted, freely drained soils that formed under a Mediterranean climate and that have weatherable minerals in the sand fraction. These soils are moist in the winter and very dry in the summer

and have low available water capacity. The textures in all horizons between the depths of 10 and 40 inches or from 10 inches to a lithic or paralithic contact are limited to sand, coarse sand, loamy sand, or loamy coarse sand. In all the horizons, gravel or coarser fragments make up less than 35 percent by volume. Xeropsamments are not permanently saturated with water. Three subgroups of Xeropsamments are recognized in the survey area. Typic Xeropsamments are somewhat excessively drained soils; depth to soft bedrock is 10 to 20 inches for the Pacifico soil, 20 to 40 inches for the Corbett soil, and 20 to 50 inches for the Preston soil. Lithic Xeropsamments are like Typic Xeropsamments except that they are shallow over hard rock. Wapi soils are 10 to 20 inches deep to granitic or metamorphic rock and are in this subgroup. Aquic Xeropsamments are saturated with water at some time during the year and have characteristics associated with wetness, such as mottles and gley colors within 40 inches of the surface. The somewhat poorly drained Cagey soil is in this subgroup.

Inceptisols are soils in moister regions that show slight evidences of change. They have altered horizons that have lost bases, or iron and aluminum, but retain some weatherable minerals, or they have horizons of slight accumulation of translocated lime, silica, iron, or bases. One great group with two subgroups is recognized in this survey area. Xerochrepts are well drained and somewhat excessively drained brownish soils that formed under a Mediterranean climate. They are shallow and moderately deep. The Typic Xerochrepts have a cambic horizon and occur in a climatic regime that is moist and cool in winter and dry thoroughly in the summer. Soils of the Brader, Green Bluff, Merkel, Olete, Osito, and Switchback families are placed in the subgroup Typic Xerochrepts. Lithic Xerochrepts are like Typic Xerochrepts except that they are shallow to hard rock. Goulding soils are 10 to 20 inches thick over hard metamorphic rock and are placed in the subgroup Lithic Xerochrepts.

Mollisols are soils that have a relatively thick dark colored surface layer that is high in bases. The surface layer is not both hard and massive when dry and is more than 1 percent organic matter. In the survey area the Mollisols are in two great groups that have one to four subgroups.

The Haploxerolls are well drained and somewhat excessively drained, brownish soils which have a regular decrease in organic carbon. They consist of four subgroups.

The Entic Haploxerolls are somewhat excessively drained soils such as those of Tollhouse and Winthrop families. These soils lack horizons or have only weakly developed horizons beneath the dark colored surface layer.

The Typic Haploxerolls are well drained and somewhat excessively drained soils which have a cambic horizon beneath the dark colored surface layer. Kilburn and San Andreas families are in this subgroup.

Pachic Haploxerolls are well drained soils and have a thicker dark colored surface layer (more than 20 inches thick) than is typical of the Haploxerolls. Oak Glen soils are the only soils in this subgroup in the survey area.

Ultic Haploxerolls are well drained soils and have a lower base saturation than is typical of the Haploxerolls. Wind River soils are the only soils in this subgroup in the survey area.

The Typic Calcixerolls is the only subgroup of Calcixerolls in the survey area. Soils in this subgroup are moderately deep to deep, do not have a fluctuating ground water table accompanied by mottles, have a moderately thick dark colored surface horizon, and have a horizon of calcium carbonate ($CaCO_3$) accumulation and are calcareous in all overlying horizons. Lizzant soils are in this subgroup.

Taxonomic Unit Descriptions

In this section, each soil family or higher category recognized in the survey area is described. The descriptions are arranged in alphabetical order. Characteristics of the soil and the material in which it formed are identified for each family. A pedon, a small three-dimensional area of the soil that is typical of the soil profile in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (4). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (5). The soil moisture condition at the time soil colors were described is given. Following the pedon description is the range of important characteristics of the soils in each family. The map units of each soil family are described in the section "Detailed Soil Map Units."

AVAWATZ FAMILY

The Avawatz family consists of very deep, somewhat excessively drained soils that formed in recent alluvium weathered from granitic and metamorphic rock. They are on flood plains and in drainageways at elevations of 3,200 to 6,000 feet. Slopes range from 2 to 10 percent. Annual precipitation is 10 to 20 inches.

Taxonomic class: These soils are sandy, mixed, mesic Mollic Xerofluvents. Typical pedon of the Avawatz family is in a unit of Avawatz-Oak Glen, dry families association, 2 to 15 percent slopes under pinyon pine and Joshua tree on a flood plain at an elevation of 4,900 feet and slope of 3 percent.

A1-0 to 8 inches; brown (10YR 5/3) gravelly loamy coarse sand, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine and fine pores; 20 percent pebbles; neutral (pH 7.0); clear smooth boundary.

C1-8 to 22 inches; brown (10YR 5/3) gravelly coarse sand, dark brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; common very fine pores; 25 percent pebbles; neutral (pH 6.8); gradual smooth boundary.

IIC2-22 to 60 inches; grayish brown (10YR 5/2) loamy coarse sand, dark grayish brown (10YR 4/2) moist; massive; soft, friable, nonsticky and nonplastic; few very fine roots; few very fine pores; fine strata of gravelly loamy sand and sandy loam 1/2 to 1 inch thick; 5 percent pebbles; neutral (pH 6.8).

Type location: About 50 feet due south of Angeles National Forest sign and 50 feet west of Horse Canyon channel; 1,650 feet west and 660 feet south of the northeast corner of sec. 3, T. 3 N., R. 7 W., Phelan Quadrangle.

Range in charateristics: The mean annual soil temperature at a depth of 20 inches is 47 to 59 degrees F. The soil moisture control section is estimated usually to be dry in all parts from late in May to late in October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 10YR 5/3, 5/2, or 4/2; it has moist color of 10YR 3/3 or 3/2. It is sandy loam or loamy sand and is 5 to 20 percent gravel.

The C horizon has dry color of 10YR 6/4, 6/3, 6/2, 5/3, or 5/2; it has moist color of 10YR 4/4, 4/3, or 4/2. It is stratified sandy loam, loamy coarse sand, loamy sand, or sand and is 0 to 35 percent gravel.

Vegetation: pinyon pine, Joshua tree, and sagebrush.

BRADER FAMILY

The Brader family consists of shallow, somewhat excessively drained soils that formed in material weathered from granitic rock or fine-grained sandstone. They are on hills and mountainsides at elevations of 4,000 to 7,200 feet. Slopes range from 15 to 50 percent. Annual precipitation is 20 to 30 inches.

Taxonomic class: These soils are loamy, mixed, mesic, shallow Typic Xerochrepts.

Typical pedon of the Brader family is in a unit of Green Bluff-Brader families association, 15 to 50 percent slopes under ponderosa pine and black oak on a northwest-facing, slightly convex mountainside at an elevation of 5,200 feet and slope of 25 percent.

O1-1/2 inch to 0; undecomposed and partly decomposed pine needles and oak leaves.

A1-0 to 3 inches; brown (10YR 5/3) gravelly loamy coarse sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; common fine and medium pores; 20 percent pebbles; slightly acid (pH 6.5); clear wavy boundary.

B2-3 to 16 inches; yellowish brown (10YR 5/4) gravelly coarse sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine, medium, and coarse roots; common fine and medium pores and few coarse pores; 20 percent pebbles; slightly acid (pH 6.5); clear irregular boundary.

C1-16 to 19 inches; light yellowish brown (2.5Y 6/4) very gravelly loamy coarse sand, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; common fine and medium roots; common fine and medium pores; 40 percent pebbles; medium acid (pH 6.0); clear irregular boundary.

C2r-19 inches; highly weathered granite; roots in cracks.

Type location: 100 feet west and 1,000 feet south of the northeast corner of sec. 24, T. 5 S., R. 2 E., Idyllwild NW. Quadrangle.

Range in characteristics: Depth to a paralithic contact is 10 to 20 inches. The mean annual soil temperature at the contact is 47 to 59 degrees F. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3). It is 15 to 35 percent rock fragments.

The A horizon has dry color of 2.5Y 4/2, or of 10YR 5/2, 5/3, 5/4, or 4/4; it has moist color of 10YR 3/2, 3/3, or 4/4 or of 2.5Y 3/2. It is loamy coarse sand, coarse sandy loam, sandy loam, loam, or very fine sandy loam.

The B horizon has dry color of 2.5Y 5/2 or of 10YR 5/3, 5/4, 6/4 or 7/2; it has moist color of 10YR 4/3, 4/4, or 5/3, or of 2.5Y 4/2. It is loam, coarse sandy loam, or very fine sandy loam.

The C horizon has dry color of 2.5Y 5/2 or 6/4, or of 10YR 6/4 or 7/2; it has moist color of 2.5Y 4/2 or 5/4, or of 10YR 5/4 or 6/2. It is coarse sandy loam or very fine sandy loam.

Very fine sandy loam textures are confined to areas where the soil formed in material weathered from fine-grained sandstone.

Vegetation: canyon live oak, Coulter pine, pinyon pine, mountain whitethorn, white fir, incense-cedar, black oak, ponderosa pine, and manzanita.

CAGEY FAMILY

The Cagey family consists of very deep, somewhat poorly drained soils that formed in alluvium weathered from granitic and metamorphic rock. They are on the valley floor of Garner Valley at elevations of 4,400 to 4,800 feet. Slopes range from 2 to 15 percent. Annual precipitation is 15 to 25 inches.

Taxonomic class: These soils are mixed, mesic Aquic Xeropsamments.

Typical pedon of the Cagey family is in a unit of Cagey family-Riverwash association, 2 to 15 percent slopes under perennial grasses on a valley floor at an elevation of 4,500 feet and slope of 2 percent.

A1-0 to 5 inches; brown (10YR 5/3) sand, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and plastic; common very fine and fine roots; many very fine, fine, and medium pores; neutral; (pH 7.0); gradual wavy boundary.

C1-5 to 9 inches; pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine pores; strata of dark brown (10YR 4/3) loamy coarse sand 1/4 to 1/2 inch thick; neutral (pH 7.0); clear wavy boundary.

IIC2-9 to 60 inches; very pale brown (10YR 7/4) stratified coarse sand and brown loamy sand (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; few very fine and fine roots; many very fine pores; strata of loamy sand 1/4 to 1/2 inch thick; neutral (pH 7.0).

Type location: 1,100 feet east and 500 feet south of the northwest corner of sec. 23, T. 6 S., R. 3 E., Idyllwild NW. Quadrangle.

Range in characteristics: The mean annual soil temperature at a depth of 20 inches is 47 to 50 degrees F. The soil moisture control section is estimated usually to be dry in all parts from early in July to late in October and to be moist in some or all parts during the rest of the year. In most years, it is intermittently saturated with water below a depth of 20 inches from late in December to late in March, depending on the water level of Lake Hemet. The profile is slightly acid or neutral (pH 6.1 to 7.3). It is 0 to 35 percent rock fragments.

The A horizon has dry color of 10YR 6/3 or 5/3; it has moist color of 10YR 4/3 or 4/2. It is loamy sand or sand.

The C horizon has dry color of 10YR 7/4, 6/4, or 6/3; it has moist color of 10YR 6/2, 5/3, or 4/3. It is stratified loamy sand, loamy coarse sand, sand, or coarse sand.

Vegetation: sedges, wild rye, and perennial grasses.

CORBETT FAMILY

The Corbett family consists of moderately deep, somewhat excessively drained soils that formed in material weathered from granitic rock. They are on hills and mountainsides at elevations of 7,000 to 9,600 feet. Slopes range from 2 to 50 percent. Annual precipitation is 30 to 40 inches.

Taxonomic class: These soils are mixed, frigid Typic Xeropsamments.

Typical pedon of the Corbett family is in a unit of Wapal-Corbett families association, 30 to 50 percent slopes, under Jeffrey pine and white fir on a north-facing mountainside at an elevation of 7,900 feet and slope of 40 percent.

A1-0 to 6 inches; dark grayish brown (10YR 4/2) gravelly sandy loam, dark brown (10YR 3/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine pores; 15 percent pebbles; neutral (pH 7.0); clear wavy boundary.

C1-6 to 14 inches; pale brown (10YR 6/3) gravelly loamy sand, olive brown (2.5Y 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine pores; 15 percent weathered pebbles; slightly acid (pH 6.5); gradual wavy boundary.

C2-14 to 25 inches; olive yellow (2.5Y 6/6) gravelly loamy sand, light olive brown (2.5Y 5/4) moist; single grain; loose, nonsticky and nonplastic; common fine roots; few fine and many very fine pores; 20 percent pebbles and 5 percent disintegrated cobbles; slightly acid (pH 6.5); clear smooth boundary.

C3r-25 inches; highly weathered granite that is easily cut with a shovel; roots in fractures which are 1/8 to 1/4 inch wide and less than 4 inches apart.

Type location: About 15 feet below the Fuller Ridge Trail; 3,740 feet east and 3,040 feet north of the southwest corner of sec. 12, T. 4 S., R. 3 E., Palm Springs SW. Quadrangle.

Range in characteristics: Depth to paralithic contact is 20 to 40 inches. The mean annual soil temperature at a depth of 20 inches is 42 to 47 degrees F. The soil moisture control section is estimated usually to be dry in all parts from early in July to late in October and to be moist in some or all parts during the rest of the year. The profile is medium acid to neutral (pH 5.6 to 7.3). It is 0 to 35 percent rock fragments.

The A horizon has dry color of 10YR 5/3 or 4/2 or of 2.5Y 5/4; it has moist color of 10YR 3/4, 3/3, or 3/2 or of 2.5Y 4/4. It is sandy loam or loamy sand.

The C horizon has dry color of 10YR 6/6, 6/4, or 6/3 or of 2.5Y 6/6; it has moist color of 10YR 4/6 or 4/4, or of 2.5Y 5/4 or 4/4. It is loamy sand or loamy coarse sand.

Vegetation: white fir, Jeffrey pine, lupine, mountain whitethorn, ponderosa pine, lodgepole pine, and limber pine.

GOULDING FAMILY

The Goulding family consists of shallow, well drained soils that formed in material weathered from metamorphic rocks. They are on hills and mountainsides at elevations of 5,000 to 8,000 feet. Slopes range from 15 to 75 percent. Annual precipitation is 15 to 30 inches.

Taxonomic class: These soils are loamy-skeletal, mixed, mesic Lithic Xerochrepts.

Typical pedon of the Goulding family is in a unit of Olete-Goulding families association, 15 to 30 percent slopes under pinyon pine and juniper on a south-facing mountainside at an elevation of 6,700 feet and slope of 25 percent.

A1-0 to 3 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable, nonsticky and nonplastic; few fine and medium roots; many very fine and fine pores; 15 percent pebbles; neutral (pH 7.0); gradual wavy boundary.

B2-3 to 12 inches; yellowish brown (10YR 5/4) very gravelly loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; hard, very firm, slightly sticky and nonplastic; few fine and common medium roots; many very fine and fine pores; 35 percent pebbles and 15 percent cobbles; slightly acid (pH 6.5); gradual wavy boundary.

R-12 inches; hard, slightly weathered fractured gneiss; fractures are 1/2 to 3/4 inch wide and less than 6 inches apart; roots in fractures.

Type location: About 30 feet south of Forest Service Road No. 2N02; 1,320 feet east and 1,250 feet north of the southwest corner of sec. 10, T. 2 N., R. 2 E., Big Bear City Quadrangle.

Range in characteristics: Depth to lithic contact is 10 to 20 inches. The mean annual soil temperature at the contact is 47 to 59 degrees F. The soil moisture control section is estimated usually to be dry in all parts from late in May to late in October and to be moist in some or all parts during the rest of the year. The profile is sandy loam or loam, and it is slightly acid to neutral (pH 6.1 to 7.3). It is 35 to 60 percent rock fragments.

The A horizon has dry color of 10YR 5/4, 5/3, 4/4, or 4/3; it has moist color of 10YR 5/3, 4/3, 4/2, 3/3, or 3/2.

The B horizon has dry color of 10YR 6/4, 5/4, or 5/3; it has moist color of 10YR 5/4, 4/4, or 4/3.

Vegetation: pinyon pine, juniper, canyon live oak, bitterbrush, rabbitbrush, mountain mahogany, and ceanothus.

GREEN BLUFF FAMILY

The Green Bluff family consists of moderately deep to deep, well drained soils that formed in material weathered from granitic rock. They are on hills and mountainsides at elevations of 4,500 to 6,000 feet. Slopes range from 15 to 40 percent. Annual precipitation is 20 to 30 inches.

Taxonomic class: These soils are coarse-loamy, mixed, mesic Typic Xerochrepts.

Typical pedon of the Green Bluff family is in a unit of Green Bluff-Brader family association, 15 to 50 percent slopes under Coulter pine and manzanita on a northwest-facing mountainside at an elevation of 5,200 feet and slope of 40 percent.

A1-0 to 6 inches; dark grayish brown (10YR 4/2) gravelly coarse sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; many very fine and fine pores; 20 percent pebbles; neutral (pH 7.0); gradual wavy boundary.

B2-6 to 22 inches; light yellow brown (10YR 6/4) gravelly coarse sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; few fine and medium roots; common fine pores; 20 percent pebbles; slightly acid (pH 6.5); clear wavy boundary.

C1-22 to 26 inches; pale brown (10YR 6/3) loamy coarse sand, brown (10YR 5/3) moist; single grain; loose; nonsticky and nonplastic; few fine roots; common very fine and fine pores; 10 percent pebbles; slightly acid (pH 6.5); gradual wavy boundary.

C2r-26 inches; highly weathered granodiorite; no roots.

Type location: About 50 yards due west of Highway 243; 2,970 feet east and 800 feet south of the northwest corner of sec. 28, T. 4 S., R. 2 E., Lake Fulmor Quadrangle.

Range in characteristics: Depth to paralithic contact is 20 to 50 inches. The mean annual soil temperature at a depth of 20 inches is 47 to 59 degrees F. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 10YR 4/3, 4/4, 5/2, 5/3, 5/4, or 6/3 or of 2.5Y 4/2 or 5/2; it has moist color of 10YR 3/2, 3/3, 4/2, 4/3, or 5/3 or of 2.5Y 3/2 or 4/2. It is coarse sandy loam, sandy loam, or loam and is 5 to 35 percent rock fragments.

The B horizon has dry color of 10YR 5/4, 5/6, 6/3, 6/4, or 7/6, or of 2.5Y 6/2; it has moist color of 10YR 4/3, 4/4, 5/4, or 6/4, or of 2.5Y 5/2. It is coarse sandy loam, sandy loam, or loam and is 5 to 35 percent rock fragments.

The C horizon is coarse sandy loam, loamy coarse sand, or loamy sand and is 10 to 35 percent rock fragments.

Vegetation: ponderosa pine, Jeffrey pine, Coulter pine, mountain whitethorn, black oak, manzanita, and buckwheat.

HANFORD FAMILY

The Hanford family consists of very deep, well drained soils that formed in alluvium weathered from granitic and metamorphic rock. They are on alluvial fans at elevations of 1,600 to 4,000 feet. Slopes range from 5 to 15 percent. Annual precipitation is 15 to 25 inches.

Taxonomic class: These soils are coarse-loamy, mixed, nonacid, thermic Typic Xerorthents.

Typical pedon of the Hanford family is in a unit of Soboba-Hanford families association, 2 to 15 percent slopes under chamise, buckwheat, and annual grasses on an alluvial fan at an elevation of 3,500 feet and slope of 12 percent.

O1-1/2 inch to 0; partly decomposed annual grasses and chaparral leaves.

A1-0 to 6 inches; brown (10YR 5/3) coarse sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many fine pores; slightly acid (pH 6.1); gradual smooth boundary.

C-6 to 60 inches; pale brown (10YR 6/3) sandy loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; many fine pores; slightly acid (pH 6.5).

Type location: About 1/8 mile west of Highway 138 and Pioneer Historic Marker; 2,000 feet west and 1,320 feet south of the northeast corner of sec. 17, T. 3 N., R. 6 W., Telegraph Peak Quadrangle.

Range in characteristics: The mean annual soil temperature at a depth of 20 inches is 59 to 68 degrees F. The soil moisture control section is estimated usually to be dry in all parts from late in May to late in October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 10YR 5/3, 5/2, 4/3, or 4/2; it has moist color of 10YR 3/2, 3/3, 4/3, or 4/2. It is coarse sandy loam or sandy loam.

The C horizon has dry color of 10YR 6/4, 6/3, 6/2, 5/4, or 5/3; it has moist color of 10YR 5/4, 5/3, 4/3, or 4/2. It is coarse sandy loam or sandy loam in the upper 40 inches. Below 40 inches it is sandy loam, coarse sandy loam, loamy sand, or sand. The upper 40 inches of the C horizon is 0 to 25 percent rock fragments. In some pedons it is 10 to 50 percent rock fragments below a depth of 40 inches.

Vegetation: chamise, buckwheat, rabbitbrush, manzanita, yucca, ceanothus, and annual grasses.

HECKER FAMILY

The Hecker family consists of very deep, well drained soils that formed in material weathered from slightly consolidated alluvium derived from granitic and metamorphic rock. They are on alluvial fans and terraces at elevations of 5,000 to 7,800 feet. Slopes range from 2 to 50 percent. Annual precipitation is 20 to 35 inches.

Taxonomic class: These soils are loamy-skeletal, mixed, mesic Mollic Haploxeralfs.

Typical pedon of the Hecker family is in a unit of Morical, very deep-Hecker families complex, 15 to 30 percent slopes under Jeffrey pine, white fir, and incense-cedar on a southwest-facing alluvial fan where the elevation is 6,800 feet and slope is 15 percent.

A1-0 to 6 inches; dark brown (10YR 4/3) gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, slightly sticky and nonplastic; common very fine, fine, and medium roots; many very fine and fine pores; 20 percent pebbles and 5 percent cobbles; neutral (pH 7.2); clear wavy boundary.

B1t-6 to 20 inches; yellowish brown (10YR 5/4) very gravelly fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few moderately thick clay films on the faces of peds; common fine, medium, and coarse roots; many very fine and fine pores; 30 percent pebbles and 5 percent cobbles; slightly acid (pH 6.5); gradual wavy boundary.

B2t-20 to 37 inches; yellowish brown (10YR 5/4) very gravelly fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; common moderately thick clay films on faces of the peds; few very fine and fine roots and common medium roots; common very fine and fine pores; 40 percent pebbles and 15 percent cobbles; slightly acid (pH 6.1); gradual irregular boundary.

B3-37 to 50 inches; brownish yellow (10YR 6/6) extremely gravelly fine sandy loam, yellowish brown (10YR 5/6) moist; weak coarse subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; few very fine roots; few very fine pores; 40 percent pebbles and 20 percent cobbles; slightly acid (pH 6.5); gradual wavy boundary.

C-50 to 60 inches; very pale brown (10YR 7/3) extremely gravelly loam, pale brown (10YR 6/3) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; few fine roots; few very fine pores; 40 percent pebbles and 20 percent cobbles; slightly acid (pH 6.5).

Type location: 2,970 feet east and 850 feet south of the northwest corner of sec. 21, T. 1 N., R. 1 E., Big Bear Lake Quadrangle.

Range in characteristics: The mean annual soil temperature at 20 inches is 47 to 59 degrees F. The soil moisture control section is estimated usually to be dry in all parts from late in June to late in October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 10YR 4/2, 4/3, 4/4, or 5/3; it has moist color of 10YR 3/2 or 3/3. It is fine sandy loam or sandy loam and is 5 to 40 percent rock fragments.

The B2t horizon has dry color of 10YR 4/4, 5/4, 6/3, 6/6, or 7/3; it has moist color of 10YR 4/3, 4/4, 5/3, or 5/6. It is loam, fine sandy loam, or sandy clay loam and is 35 to 60 percent rock fragments.

The C horizon has dry color of 2.5Y 5/4 or 6/4 or of 10YR 7/3; it has moist color of 2.5Y 4/4 or 5/4 or of 10YR 5/4 or 6/3. It is loam or sandy loam and is 50 to 60 percent rock fragments.

Vegetation: Jeffrey pine, white fir, incense-cedar, sugar pine, and mountain whitethorn.

HODGSON FAMILY

The Hodgson family consists of very deep, well drained soils that formed in alluvium weathered from granitic and metamorphic rock. They are on old terraces and alluvial fans at elevations of 5,000 to 6,000 feet. Slopes range from 2 to 25 percent. Annual precipitation is 20 to 35 inches.

Taxonomic class: These soils are fine, mixed, mesic Typic Palexeralfs.

Typical pedon of the Hodgson family is in a unit of Morical, very deep-Hodgson families association, 2 to 15 percent slopes under chamise, buckwheat, low-growing forbs, and scattered pinyon pine on an old terrace at an elevation of 5,280 feet and slope of 13 percent.

A1-0 to 2 inches; dark yellowish brown (10YR 4/4) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, very firm, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine pores; neutral (pH 7.2); clear smooth boundary.

B1t-2 to 12 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; moderate medium subangular blocky structure; hard, very firm, slightly sticky and slightly plastic; many thick clay films in pores and common moderately thick films on faces of peds; few fine and medium roots; common very fine and fine pores; neutral (ph 7.2); clear wavy boundary.

B21t-12 to 18 inches; yellowish red (5YR 4/6) clay, reddish brown (5YR 4/4) moist; strong medium subangular blocky structure; very hard, very firm, sticky and plastic; continuous thick clay films on faces of peds; few fine roots; few fine pores; neutral (pH 7.0); clear wavy boundary.

B22t-18 to 40 inches; yellowish red (5YR 4/6) clay, reddish brown (5YR 4/4) moist; strong medium subangular blocky structure; very hard, very firm, sticky and plastic; continuous thick clay films on the faces of peds; few medium roots; few fine pores; neutral (pH 7.0); clear wavy boundary.

B23t-40 to 60 inches; yellowish red (5YR 4/6) clay, reddish brown (5YR 4/4) moist; strong coarse subangular blocky structure; hard, very firm, sticky and plastic; many thick clay films on the ped faces; few fine roots; few fine pores; neutral (pH 7.0).

Type location: About 1 mile east of Goff Flat; 1,500 feet east and 1,600 feet south of the northwest corner of sec. 19, T. 6 S., R. 4 E., Idyllwild NE. Quadrangle.

Range in characteristics: The mean annual soil temperature at a depth of 20 inches is 47 to 59 degrees F. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October and to be moist in some or all parts during the rest of the year. The profile is medium acid to neutral (pH 5.6 to 7.3).

The A horizon has dry color of 10YR 5/4 or 4/4 or of 7.5YR 4/4; it has moist color of 10YR 4/4, 4/3, or 3/2 or of 7.5YR 3/2. It is loam or clay loam and is 0 to 35 percent rock fragments.

The Bt horizon has dry color of 10YR 7/4 or 6/4; 7.5YR 6/6, 6/8, 5/6, 5/4, or 4/4; or of 5YR 5/6, 5/4, 4/6, or 4/4; it has moist color of 10YR 5/6 or 5/5; 7.5YR 6/6, 5/6, 4/6 or 4/4; or of 5YR 3/4 or 4/4. It is clay loam or clay and is 0 to 15 percent rock fragments.

Vegetation: chamise, manzanita, mountain mahogany, scattered pinyon pine, sagebrush, buckwheat, annual grasses, and low-growing forbs.

KILBURN FAMILY

The Kilburn family consists of moderately deep, well drained soils that formed in material weathered from metamorphic rock. They are on mountainsides at elevations of 4,800 to 8,000 feet. Slopes range from 30 to 50 percent. Annual precipitation is 15 to 30 inches.

Taxonomic class: These soils are loamy-skeletal, mixed, mesic Typic Haploxerolls.

Typical pedon of the Kilburn family is in a unit of Olete-Kilburn-Goulding families complex, 30 to 50 percent slopes under canyon live oak on a north-facing mountainside at an elevation of 4,800 feet and slope of 50 percent.

A11-0 to 7 inches; brown (10YR 4/3) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many fine roots; many fine interstitial pores; 15 percent pebbles; neutral (pH 7.3); gradual irregular boundary.

A12-7 to 15 inches; dark yellowish brown (10YR 4/4) gravelly loam; dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky and nonplastic; many fine roots and common medium roots; common fine pores; 20 percent pebbles; slightly acid (pH 6.5); clear wavy boundary.

B2-15 to 30 inches; light yellowish brown (10YR 6/4) very gravelly loam, brown (7.5YR 4/4) moist; massive; soft, very friable, slightly sticky and nonplastic; few fine and medium roots; many fine pores; 40 percent pebbles; slightly acid (pH 6.5); gradual wavy boundary.

C-30 to 35 inches; yellowish brown (10YR 5/6) very gravelly loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and nonplastic; few fine roots; many fine pores; 45 percent pebbles; slightly acid (pH 6.5); gradual wavy boundary.

R-35 inches; hard fractured schist; fractures are 1/4 to 1/2 inch wide and 2 to 4 inches apart; roots in fractures.

Type location: 2,000 feet west and 2,000 feet south of the northeast corner of sec. 27, T. 3 N., R. 7 W., Telegraph Peak Quadrangle.

Range in characteristics: Depth to a lithic contact is 20 to 40 inches. The mean annual soil temperature at a depth of 20 inches is 47 to 59 degrees F. The soil moisture control section is estimated usually to be dry in all parts from late in June to late in October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 10YR 4/3, 4/4, 3/3, or 4/2; it has moist color of 7.5YR 3/4, or of 10YR 2/1, 3/1, 2/2, 3/2, or 3/3. It is sandy loam or loam and is 15 to 45 percent rock fragments. In some pedons the surface 1 or 2 inches is loamy sand.

The B horizon has dry color of 10YR 6/4, 5/6, 5/4, or 5/2; it has moist color of 10YR 5/3 or 5/4 or of 7.5YR 4/4. It is sandy loam or loam and is 35 to 50 percent rock fragments.

The C horizon has dry color of 10YR 5/2, 5/3, 5/4, 5/6, 6/3, or 7/6; it has moist color of 10YR 4/2, 4/3, 4/4, 5/4, or 5/6. It is sandy loam or loam and is 35 to 60 percent rock fragments.

Vegetation: Jeffrey pine, ponderosa pine, manzanita, pinyon pine, buckwheat, annual grasses, canyon live oak, and black oak.

LITHIC XERORTHENTS

Lithic Xerorthents consist of shallow, somewhat excessively drained or excessively drained soils that formed in material weathered from granitic rock, metamorphic rock, or limestone. They are on ridges, hills and mountainsides at elevations of 1,800 feet to 10,500 feet. Slopes range from 15 to 90 percent. Annual precipitation is 10 to 40 inches.

In a representative profile of this subgroup the surface layer is light brownish gray (10YR 6/2) very gravelly coarse sandy loam 7 inches thick. The substratum to a depth of 18 inches is light gray (10YR 7/2) very gravelly coarse sandy loam. Below this is hard, highly fractured metamorphic rock.

Depth to hard unweathered rock is 10 to 20 inches. The profile is loam, sandy loam, or coarse sandy loam and is 5 to 80 percent rock fragments, or it is loamy sand and is 35 to 80 percent rock fragments.

The mean annual soil temperature at the contact is 47 to 54 degrees F. Where mapped as the calcareous phase the mean annual soil temperature at the contact is 47 to 63 degrees F; it is 40 to 47 degrees where mapped as the cool phase, 54 to 59 degrees F where mapped as the dry phase, and 59 to 70 degrees F where mapped as the warm phase.

The soil moisture control section is estimated usually to be dry in all parts from late in June to late in October and to be moist in some or all parts the rest of the year. Where mapped as the calcareous or cool phases, the soil moisture control section is estimated usually to be dry from mid-June to late in October, and from late in May to early in November where mapped as the dry or warm phases.

Vegetation: Jeffrey pine, ponderosa pine, Coulter pine, and canyon live oak; pinyon pine, juniper, Joshua tree, yucca, and scrub oak where mapped as the calcareous phase; Jeffrey pine, ponderosa pine, white fir, mountain whitethorn, manzanita, and lodgepole pine (confined to elevations above 8,000 feet) where mapped as the cool phase; ceanothus, pinyon pine, manzanita, and interior live oak where mapped as the dry phase; and pinyon pine, juniper, scrub oak, chamise, manzanita, ceanothus, interior live oak, and buckwheat where mapped as the warm phase.

LIZZANT FAMILY

The Lizzant family consists of moderately deep to deep, well drained soils that formed in material weathered from limestone. They are on hills and mountainsides at elevations of 5,000 to 8,000 feet. Slopes range from 15 to 50 percent. Annual precipitation is 20 to 30 inches.

Taxonomic class: These soils are loamy-skeletal, carbonatic, frigid Typic Calcixerolls.

Typical pedon of the Lizzant family is in a unit of Lithic Xerorthents, calcareous-Lizzant family, 30 to 50 percent slopes under pinyon pine and juniper on a northeast-facing mountainside at an elevation of 7,200 feet and slope of 45 percent.

A1-0 to 11 inches; brown (10YR 5/3) very cobbly fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure in the upper 2 inches, massive below; soft, very friable, nonsticky and nonplastic; common fine roots; common very fine and fine pores; slightly effervescent; 10 percent pebbles and 25 percent cobbles; moderately alkaline (pH 8.0); clear wavy boundary.

B2-11 to 24 inches; light yellowish brown (10YR 6/4) very cobbly fine sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few fine and medium roots; common very fine and fine pores; slightly effervescent; few fine filaments of lime; 15 percent pebbles and 25 percent cobbles; moderately alkaline (pH 8.0); clear wavy boundary.

Cca-24 to 46 inches; yellow (10YR 7/6) very cobbly sandy loam, light yellowish brown (10YR 6/4) moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; common very fine and fine pores; strongly effervescent; common fine filaments of lime; 15 percent pebbles and 35 percent cobbles; moderately alkaline (pH 8.0); clear irregular boundary.

R-46 inches; hard, unweathered fractured limestone; fractures are 1/4 to 1 inch wide and 2 to 6 inches apart; roots in fractures.

Type location: North of Bertha Ridge; 1,350 feet east and 1,800 feet north of the southwest corner of sec. 3, T. 2 N., R. 1 E., Big Bear City Quadrangle.

Range in characteristics: Depth to lithic contact is 20 to 45 inches. A paralithic contact is present in some pedons. The weathered rock is 5 to 24 inches thick and breaks down to a fine sand or loamy fine sand. The mean annual soil temperature at a depth of 20 inches is 44 to 47 degrees F. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October and to be moist in some or all parts during the rest of the year. The profile is moderately to strongly alkaline (pH 7.9 to 9.0).

The A horizon has dry color of 10YR 5/3, 4/3, or 4/4; it has moist color of 10YR 3/2 or 3/3. It is fine sandy loam or loam and is 15 to 35 percent rock fragments.

The B horizon has dry color of 10YR 5/3, 5/4, 6/3, or 6/4 or of 2.5Y 5/2, 5/4, or 6/4; it has moist color of 10YR 4/4 or 5/4 or of 2.5Y 5/2 or 5/4. It is loam or fine sandy loam and is 35 to 60 percent rock fragments. The B horizon is slightly to strongly effervescent.

The C horizon has dry color of 2.5Y 6/2 or 6/4 or of 10YR 6/3, 6/4, or 7/6; it has moist color of 2.5Y 5/2 or 5/4 or of 10YR 6/4 or 5/4. It is sandy loam and is 35 to 60 percent rock fragments. The C horizon is strongly to violently effervescent.

Vegetation: pinyon pine, juniper, and annual grasses.

MERKEL FAMILY

The Merkel family consists of moderately deep, well drained soils that formed in material weathered from metamorphic rocks. They are on hills and mountainsides at elevations of 7,000 to 9,000 feet. Slopes range from 15 to 50 percent. Annual precipitation is 25 to 40 inches.

Taxonomic class: These soils are loamy-skeletal, mixed, frigid Typic Xerochrepts.

Typical pedon of the Merkel family is in a unit of Merkel-Wapal families complex, 30 to 50 percent slopes under white fir and Jeffrey pine on a north-facing mountainside at an elevation of 8,600 feet and slope of 50 percent.

A1-0 to 3 inches; dark brown (10YR 4/3) very gravelly loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; common very fine and fine pores; 30 percent pebbles and 5 percent cobbles; neutral (pH 7.0); gradual smooth boundary.

B2-3 to 18 inches; light yellowish brown (10YR 6/4) very gravelly loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and medium roots; few fine and medium pores; 30 percent pebbles and 10 percent cobbles; slightly acid (pH 6.5); gradual wavy boundary.

C-18 to 30 inches; light yellowish brown (2.5Y 6/4) very gravelly loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; few fine roots; few fine pores; 60 percent pebbles; neutral (pH 6.8); gradual wavy boundary.

R-30 inches; slightly weathered fractured gneiss; fractures are 1/4 to 1/2 inch wide and 6 to 10 inches apart.

Type location: Above Wildhorse Meadows just east of Forest Service Road No. 2N93; 3,300 feet east and 1,980 feet southwest of sec. 4, T. 1 N., R. 2 E., Moonridge Quadrangle.

Range in characteristics: Depth to lithic contact is 20 to 40 inches. The mean annual soil temperature at a depth of 20 inches is 40 to 47 degrees F. The soil moisture control section is estimated usually to be dry in all parts from mid-July to mid-October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 10YR 5/3 or 4/3; it has moist color of 10YR 4/3, 3/3, or 3/2. It is sandy loam or loam and is 30 to 40 percent rock fragments.

The B horizon has dry color of 10YR 6/4, 5/4, or 4/4; it has moist color of 10YR 5/3, 4/4, or 4/3. It is sandy loam or loam and is 35 to 50 percent rock fragments.

The C horizon has dry color of 2.5Y 6/2 or 6/4 or of 10YR 5/4; it has moist color of 2.5Y 5/2 or 5/4 or of 10YR 5/3 or 4/4. It is loam or sandy loam and is 35 to 60 percent rock fragments.

Vegetation: white fir, Jeffrey pine, black oak, sugar pine, lodgepole pine, and chinquapin.

MODESTO FAMILY

The Modesto family consists of moderately deep to deep, well drained soils that formed in material weathered from granitic and metamorphic rock. They are on hills at elevations of 1,800 to 4,500 feet. Slopes range from 15 to 40 percent. Annual precipitation is 15 to 25 inches.

Taxonomic class: These soils are fine-loamy, mixed, thermic Mollic Haploxeralfs.

Typical pedon of the Modesto family is in a unit of San Andreas-Osito-Modesto families complex, 15 to 50 percent slopes under chamise and manzanita on an east-facing hillslope at an elevation of 3,600 feet and slope of 20 percent.

O1-1/4 inch to 0; partly decomposed and undecomposed leaves and twigs.

A1-0 to 5 inches; yellowish brown (10YR 5/4) fine sandy loam, dark brown (10YR 3/3) moist; moderate very fine granular structure in the upper 1 inch, moderate medium subangular blocky structure below; slightly hard, firm, nonsticky and nonplastic; few fine and common medium and coarse roots; common fine and few medium pores; neutral (pH 7.0); clear smooth boundary.

B11-5 to 8 inches; brown (7.5YR 5/4) fine sandy loam, dark yellowish brown (10YR 3/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and slightly plastic; few fine and common medium and coarse roots; common fine and few medium pores; slightly acid (pH 6.5); clear smooth boundary.

B12-8 to 15 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and slightly plastic; few medium and common coarse roots; common fine pores; slightly acid (pH 6.5); gradual smooth boundary.

B2t-15 to 28 inches; strong brown (7.5YR 5/6) loam, strong brown (7.5YR 4/6) moist; moderate medium and coarse subangular blocky; very hard, very firm, sticky and plastic; very few clay films bridging sand grains; few medium and coarse roots; common fine pores; slightly acid (pH 6.5); clear smooth boundary.

B3-28 to 50 inches; brownish yellow (10YR 6/6) fine sandy loam, yellowish brown (10YR 5/6) moist; moderate coarse subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; few coarse roots; common very fine and few fine pores; slightly acid (pH 6.5); gradual wavy boundary.

Cr-50 inches; highly weathered fractured granite, original rock structure apparent; fractures are 1/8 to 1/2 inch wide and less than 6 inches apart; roots in fractures.

Type location: About one-half mile north of Twin Pines Ranch; 550 feet west and 400 feet north of the southeast corner of sec. 30, T. 3 S., R. 2 E., Lake Fulmore Quadrangle.

Range in characteristics: Depth to paralithic contact is 20 to 60 inches. The mean annual soil temperature at a depth of 20 inches is 59 to 68 degrees F. The soil moisture control section is estimated usually to be dry in all parts from late in May to late in October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3). It is 0 is 15 percent rock fragments.

The A horizon has dry color of 10YR 4/3 or 5/4; it has moist color of 10YR 3/2 or 3/3. It is sandy loam, fine sandy loam, or loam.

The B2t horizon has dry color of 10YR 5/4, 5/3, or 5/6, of 7.5YR 5/6, 5/4, or 4/4, or of 5YR 5/4 or 5/6; it has moist color of 10YR 3/4, 4/4, 5/4, or 5/6, of 7.5YR 3/4 or 4/4, or of 5YR 4/3, 4/4, or 4/6. It is loam, sandy clay loam or clay loam.

A sandy loam C horizon is present in some pedons. It has hue of 10YR or 7.5YR.

Vegetation: chamise, manzanita, ceanothus, scrub oak, yerba santa, interior live oak, redshanks (San Jacinto Mts.), yucca, mountain mahogany, and annual grasses.

MORICAL FAMILY

The Morical family consists of moderately deep to very deep, well drained soils that formed in alluvium or slightly consolidated alluvial material derived from granitic or metamorphic rock. They are on valley floors, fans, terraces, hills, and mountainsides at elevations of 3,700 to 7,800 feet. Slopes range from 2 to 50 percent. Annual precipitation is 8 to 35 inches.

Taxonomic class: These soils are fine-loamy, mixed, mesic Mollic Haploxeralfs.

Typical pedon of the Morical family in a unit of Morical, very deep-Hodgson families association, 2 to 15 percent slopes under Jeffrey pine and juniper on a valley floor at an elevation of 7,400 feet and slope of 10 percent.

A1-0 to 6 inches; brown (10YR 5/3) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; hard, firm, slightly sticky and nonplastic; common fine and medium roots; common very fine and few fine pores; 15 percent pebbles; neutral (pH 6.7); abrupt smooth boundary.

B2t-6 to 26 inches; reddish yellow (7.5YR 6/6) gravelly sandy clay loam, strong brown (7.5YR 5/6) moist; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; few moderately thick clay bridges on the sand grains; common fine and medium roots and few coarse roots; common very fine and few fine pores; 15 percent pebbles; neutral (pH 6.7); clear wavy boundary.

B3t-26 to 36 inches; reddish yellow (7.5YR 6/8) gravelly sandy clay loam, reddish yellow (7.5YR 6/6) moist; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; few moderately thick clay bridges on the sand grains; few medium roots and coarse roots; common very fine and few fine pores; 15 percent pebbles; neutral (pH 7.0); clear wavy boundary.

C-36 to 60 inches; light brown (7.5YR 6/4) gravelly sandy loam, light brown (7.5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few coarse roots; few very fine pores; 15 percent pebbles; neutral (pH 7.0).

Type location: About one-half mile southwest of Wilbur's Grave in Holcomb Valley; 1,650 feet east and 2,310 feet north of the southwest corner of sec. 32, T. 3 N., R. 1 E., Fawnskin Quadrangle.

Range in characteristics: Depth to a paralithic contact commonly is 20 to 50 inches, but it is more than 60 inches in areas where the dry and very deep phases are mapped. The mean annual soil temperature at a depth of 20 inches commonly is 47 to 54 degrees F, but it is 54 to 59 degrees F in areas where the dry and very deep phases are mapped. The soil moisture control section is estimated usually to be dry in all parts from late in June to late in October, or from mid-May to late in November in areas where the dry phase is mapped; it is moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 7.5YR 5/2, of 10YR 4/2, 4/3, 4/4, 5/2, or 5/3, or of 2.5Y 3/2; it has moist color of 7.5 Y 3/2 or 3/3 or of 10YR 3/2 or 3/3. It is loam or sandy loam and is 0 to 50 percent rock fragments.

The B2t horizon has dry color of 5YR 4/4, of 7.5YR 4/4, 5/4, 5/6, or 6/6, of 10YR 4/6, 5/3, 5/4, 6/3, 6/4, or 6/6, or of 2.5Y 7/4; it has moist color of 5YR 4/3, of 7.5Y 4/4 or 5/6, of 10YR 4/3, 4/4, 5/3, 5/4, 5/5, or 5/6, or of 2.5Y 5/4. It is loam, sandy clay loam, or clay loam and is 0 to 35 percent rock fragments. Clay films are common to many and thin to moderately thick on faces of peds and in pores. The B2t horizon rests on bedrock in some pedons.

The C horizon has dry color of 7.5YR 5/4, 6/4, or 6/6, of 10YR 4/3, 5/4, 6/4, 5/6, or 6/6, or of 2.5Y 6/6; it has moist color of 7.5YR 5/4 or 5/6, of 10YR 3/3, 4/4, or 5/6, or of 2.5Y 5/4. It is loam, sandy clay loam, sandy loam, or loamy sand and is 0 to 50 percent rock fragments.

Vegetation: Coulter pine, black oak, ponderosa pine, Jeffrey pine, manzanita, mountain whitethorn, sagebrush, and annual grasses; manzanita, chamise, ceanothus, redshanks (San Jacinto Mts.), juniper, scrub oak, pinyon pine, buckwheat, yucca, and annual grasses and forbs where mapped as the dry phase; and ponderosa pine, Jeffrey pine, white fir, incense cedar, pinyon pine, juniper, Coulter pine, and canyon live oak (San Bernardino Mts.), manzanita, sagebrush, and annual grasses where mapped as the very deep phase.

OAK GLEN FAMILY

The Oak Glen family consists of very deep, well drained soils that formed in alluvium derived from granitic or metamorphic rocks or both. They are on alluvial fans and in drainageways at elevations of 3,200 to 6,500 feet. Slopes range from 2 to 30 percent. Annual precipitation is 10 to 35 inches.

Taxonomic class: These soils are coarse-loamy, mixed, mesic Pachic Haploxerolls.

Typical pedon: Typical pedon of the Oak Glen family is in a unit of Wind River-Oak Glen families association, 2 to 15 percent slopes under Coulter pine on an alluvial fan at an elevation of 4,800 feet and slope of 5 percent.

A11-0 to 15 inches; dark grayish brown (2.5Y 4/2) sandy loam, very dark grayish brown (2.5Y 3/2) moist; weak very fine granular structure in the upper most inch and massive below; soft, very friable, nonsticky and nonplastic; common fine roots; many very fine and fine pores; 5 percent pebbles; neutral (pH 7.0); gradual wavy boundary.

A12-15 to 30 inches; dark grayish brown (2.5Y 4/2) sandy loam, very dark grayish brown (2.5Y 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; common fine roots; many very fine and fine pores; 5 percent pebbles; neutral (pH 6.8); gradual wavy boundary.

C1-30 to 40 inches; grayish brown (2.5Y 5/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few medium and common fine roots; common very fine and fine pores; 5 percent pebbles; neutral (pH 6.8); gradual wavy boundary.

C2-40 to 60 inches; grayish brown (2.5Y 5/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few medium and fine roots; common very fine and fine pores; 5 percent pebbles; neutral (pH 6.8).

Type location: 1,900 feet east and 1,800 feet south of the northwest corner of sec. 31, T. 5 S., R. 3 E., Idyllwild NW. Quadrangle.

Range in characteristics: The mean annual soil temperature at a depth of 20 inches commonly is 47 to 54 degrees F, but it is 54 to 59 degrees F where the dry phase is mapped. The soil moisture control section is estimated usually to be dry in all parts from mid-July to late in October, or from mid-May to early in November where the dry phase is mapped. It is moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3). It is 0 to 20 percent rock fragments.

The A horizon has dry color of 10YR 3/1, 4/2, 4/3, or 5/2 or of 2.5Y 4/2; it has moist color of 10YR 2/1, 3/2, or 3/3 or of 2.5Y 3/2. It is coarse sandy loam or sandy loam.

The C horizon has dry color of 10YR 4/2, 4/3, or 5/2 or of 2.5Y 4/2 or 5/2; it has moist color of 10YR 3/2, 4/2, 4/3 or 4/4 or of 2.5Y 4/2 or 4/3. It commonly is coarse sandy loam, sandy loam, or fine sandy loam, but in some pedons it is loamy sand or sand that is 10 to 65 percent rock fragments below a depth of 40 inches.

Vegetation: Jeffrey pine, ponderosa pine, Coulter pine, canyon live oak, ceanothus and manzanita (Santa Ana Canyon), sagebrush, and annual grasses; ceanothus, pinyon pine, juniper, scrub oak, Coulter pine, canyon live oak, chamise, buckwheat, yucca, and annual grasses where mapped as the dry phase.

OLETE FAMILY

The Olete family consists of moderately deep, well drained soils that formed in material weathered from metamorphic rock. They are on hills and mountainsides at elevations of 4,000 to 8,000 feet. Slopes range from 15 to 65 percent. Annual precipitation is 15 to 30 inches.

Taxonomic class: These soils are loamy-skeletal, mixed, mesic Typic Xerochrepts.

Typical pedon of the Olete family is an area of Olete-Goulding families association, 30 to 50 percent slopes under pinyon pine and juniper on a northeast-facing mountainside at an elevation of 8,000 feet and slope of 40 percent.

01-2 inches to 0; loose litter and slightly decomposed juniper needles.

A1-0 to 3 inches; dark brown (10YR 4/3) very cobbly fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, slightly sticky and nonplastic; many very fine and fine roots; many very fine and fine pores; 20 percent pebbles and 20 percent cobbles; neutral (pH 7.3); clear wavy boundrary.

B2-3 to 26 inches; yellowish brown (10YR 5/4) very cobbly loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common fine, medium, and coarse roots; common very fine and fine pores and few coarse pores; 25 percent pebbles and 30 percent cobbles; neutral (pH 7.0); clear wavy boundary.

R-26 inches; highly fractured gneiss; no roots.

Type location: West side of Deadman's Canyon; 330 feet east and 660 feet south of the northwest corner of sec. 34, T. 2 N., R. 2 E., Moonridge Quadrangle.

Range in characteristics: Depth to a lithic contact is 20 to 40 inches. A paralithic contact is present in some pedons. The paralithic material is generally only a few inches thick and grades immediately into hard unweathered rock. The mean annual soil temperature at a depth of 20 inches is 47 to 59 degrees F. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 10YR 4/3, 4/4, 5/3, or 5/4, of 2.5Y 4/2, 5/4, or 5/6, or of 5Y 5/2; it has moist color of 10YR 3/2 or 3/3 or of 2.5Y 3/2 or 3/4. It is loam, sandy loam, or fine sandy loam and is 20 to 45 percent rock fragments.

The B horizon has dry color of 10YR 5/2, 5/4, 5/6, or 6/4, of 2.5Y 5/2, 5/6, 6/2, 6/4, or 6/6 or of 5Y 5/2; it has moist color of 10YR 4/2, 4/3, 4/4, 5/4, or 6/4, of 2.5Y 4/2, 4/4, 4/6, 5/2, or 5/4, or of 5Y 4/2. It is sandy loam or loam and is 35 to 50 percent rock fragments.

Vegetation: pinyon pine, juniper, Coulter pine, ceanothus, bigcone Douglas-fir, canyon live oak, ponderosa pine, white fir, Jeffrey pine, and black oak.

OSITO FAMILY

The Osito family consists of shallow, well drained soils that formed in material weathered from granitic rock, metamorphic rock, or sandstone. They are on hills and mountainsides at elevations of 1,600 to 4,200 feet. Slopes range from 15 to 50 percent. The annual precipitation is 10 to 20 inches.

Taxonomic class: These soils are loamy, mixed, thermic, shallow Typic Xerochrepts.

Typical pedon for the Osito family is in a unit of Osito-Modesto families association, 30 to 50 percent slopes under chamise and ceanothus on a west-facing hillside at an elevation of 2,000 feet and slope of 25 percent.

A1-0 to 5 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; many very fine and fine pores; 5 percent pebbles; neutral (pH 7.0); clear smooth boundary.

B2-5 to 13 inches; very pale brown (10YR 7/4) coarse sandy loam, yellowish brown (10YR 5/6) moist; moderate fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; many very fine and fine pores; neutral (pH 7.0); clear wavy boundary.

Cr-13 inches; highly weathered granite; no roots.

Type location: About one-fourth mile southwest of Highway 18; 1,320 feet east and 2,970 feet north of the southeast corner of sec. 10, T. 1 N., R. 4 W., San Bernardino North Quadrangle.

Range in characteristics: Depth to paralithic contact is 10 to 20 inches. The mean annual soil temperature at the contact is 59 to 70 degrees F. The soil moisture control section is estimated usually to be dry in all parts from late in May to late in October and to be moist in some or all parts during the rest of the year. The profile is coarse sandy loam or sandy loam and is 0 to 25 percent rock fragments.

The A horizon has dry color of 10YR 6/3, 5/3, or 5/2; it has moist color of 10YR 4/3, 4/4, or 5/3. Reaction is neutral or mildly alkaline (pH 6.6 to 7.8).

The B horizon has dry color of 10YR 5/4, 6/4, or 7/4 or of 7.5YR 4/6; it has moist color of 10YR 4/4 or 5/6 or of 7.5YR 4/4. Reaction is neutral (pH 6.6 to 7.3).

Some pedons have a thin C horizon that is sandy loam or loamy sand. The C horizon has dry color of 10YR 6/3 or 7/3 or of 2.5Y 6/2, 7/2, or 7/4; it has moist color of 10YR 4/4, 5/4, or 5/3 or of 2.5Y 5/2 or 6/2.

Vegetation: chamise, manzanita, ceanothus, interior live oak, scrub oak, redshanks (San Jacinto Mts.), and buckwheat.

PACIFICO FAMILY

The Pacifico family consists of shallow, somewhat excessively drained soils that formed in material weathered from granitic rock. They are on hills and mountainsides at elevations of 3,600 to 8,000 feet. Slopes range from 2 to 75 percent. Annual precipitation is 10 to 35 inches.

Taxonomic class: These soils are mixed, mesic, shallow Typic Xeropsamments.

Typical pedon of the Pacifico family is in a unit of Pacifico-Preston families complex, 30 to 50 percent slopes under Coulter pine and canyon live oak on a northwest-facing mountainside at an elevation of 5,800 feet and slope of 50 percent.

A1-0 to 3 inches; grayish brown (2.5Y 5/2) loamy coarse sand, dark grayish brown (2.5Y 4/2) moist; weak very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine pores; slightly acid (pH 6.5); gradual wavy boundary.

C1-3 to 15 inches; light yellowish brown (2.5Y 6/4) loamy coarse sand, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine, fine, medium, and coarse roots; many very fine and common fine and medium pores; slightly acid (pH 6.5); abrupt irregular boundary.

C2r-15 inches; highly weathered granodiorite; no roots.

Type location: 500 feet west and 2,300 feet south of the northeast corner of sec. 18, T. 5 S., R. 3 E., Idyllwild NW. Quadrangle.

Range in characteristics: Depth to paralithic contact is 10 to 20 inches. The mean annual soil temperature at the contact is 47 to 54 degrees F and 54 to 59 degrees F where the dry phase is mapped. The soil moisture control section is estimated to be dry in all parts from late in June to mid-October or late in May to late in October where the dry phase is mapped; it is moist in some or all parts during the rest of the year. The profile is loamy sand or loamy coarse sand and is 0 to 35 percent rock fragments. It is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 10YR 4/2, 4/3, 5/2, or 5/3 or of 2.5Y 5/2; it has moist color of 10YR 3/2, 3/3, 4/2, 4/3, 5/4, 6/3, or 6/4 or of 2.5Y 4/2.

The C horizon has dry color of 10YR 5/2, 5/4, 6/3, 6/4, or 6/6 or of 2.5Y 6/4; it has moist color of 10YR 4/3, 4/4, 5/3, or 5/4 or of 2.5Y 5/4.

Vegetation: Jeffrey pine, ponderosa pine, Coulter pine, canyon live oak, black oak, manzanita, and grasses; ceanothus, manzanita, juniper, scrub oak, pinyon pine, and interior live oak where mapped as the dry phase.

PRESTON FAMILY

The Preston family consists of moderately deep to deep, somewhat excessively drained soils that formed in material weathered from granitic rock. They are on hills and mountainsides at elevations of 4,800 to 7,500 feet. Slopes range from 2 to 50 percent. Annual precipitation is 20 to 35 inches.

Taxonomic class: These soils are mixed, mesic Typic Xeropsamments.

Typical pedon of the Preston family is in a unit of Pacifico-Preston families complex, 2 to 30 percent slopes under Coulter pine and black oak on a southwest-facing mountainside at an elevation of 6,700 feet and slope of 10 percent.

A1-0 to 4 inches; grayish brown (2.5Y 5/2) loamy sand, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots; many very fine and fine pores; neutral (pH 6.7); gradual wavy boundary.

C1-4 to 19 inches; light yellowish brown (2.5Y 6/4) loamy sand, olive brown (2.5Y 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots and few fine, medium, and coarse roots; common very fine and fine and few medium pores; neutral (pH 6.7); gradual wavy boundary.

C2-19 to 28 inches; pale yellow (2.5Y 7/4) gravelly loamy sand, light yellowish brown (2.5Y 6/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; common very fine and fine pores; 15 percent pebbles; neutral (pH 6.7); abrupt wavy boundary.

C3r-28 inches; highly weathered granite; no roots.

Type location: Between the Deer Springs trail and Highway 74, about 100 yards up from the trail-head sign; 660 feet east and 2,500 feet south of the northwest corner of sec. 7, T. 5 S., R. 3 E., Palm Springs SW. Quadrangle.

Range in characteristics: Depth to paralithic contact is 20 to 50 inches. The mean annual soil temperature at 20 inches is 47 to 59 degrees F. The soil moisture control section is estimated usually to be dry in all parts from late in June to early in November and to be moist in some or all parts during the rest of the year. Rock fragment content is 0 to 30 percent. The profile is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 10YR 4/2, 4/4, 5/2, 5/3, or 5/4 or of 2.5Y 3/2, 5/2, or 5/4; it has moist color of 10YR 3/2, 3/3, 4/2, or 4/3 or of 2.5Y 4/2 or 4/4. It is sandy loam or loamy sand.

The C horizon has dry color of 10YR 5/4, 6/2, 6/3, 6/4, 6/6, or 7/4 or of 2.5Y 6/4 or 7/4; it has moist color of 10YR 4/3, 4/4, 5/2, 5/3, or 5/4 or of 2.5Y 5/4, 6/4, or 4/4. It is loamy sand or sand.

Vegetation: ponderosa pine, Jeffrey pine, Coulter pine, white fir, sugar pine, incense-cedar, canyon live oak, and black oak.

RAMONA FAMILY

The Ramona family consists of very deep, well drained soils that formed in alluvium weathered from granitic rocks. They are on dissected old terraces and alluvial fans at elevations of 1,800 to 4,000 feet. Slopes range from 2 to 20 percent. Annual precipitation is 15 to 25 inches.

Taxonomic class: These soils are fine-loamy, mixed, thermic Typic Haploxeralfs.

Typical pedon of the Ramona family is in a unit of Ramona family-Typic Xerorthents, warm association, 2 to 30 percent slopes under chamise, buckwheat, and yucca on a north-facing slope of a dissected fan at an elevation of 2,400 feet and slope of 20 percent.

A1-0 to 8 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots; common very fine and fine pores; 10 percent pebbles; slightly acid (pH 6.2); clear wavy boundary.

B1-8 to 18 inches; yellowish brown (10YR 5/4) gravelly sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, firm, slightly sticky and nonplastic; few medium and coarse roots; common very fine and fine and few medium pores; 15 percent pebbles; slightly acid (pH 6.4); clear wavy boundary.

B2t-18 to 48 inches; brown (7.5YR 5/4) cobbly sandy clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; common thin clay films bridging sand grains; few medium and coarse roots; common very fine and few fine and medium pores; 20 percent cobbles; neutral (pH 6.6); gradual wavy boundary.

B3-48 to 60 inches; yellowish brown (10YR 5/4) gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; hard, firm, slightly sticky and nonplastic; few coarse roots; few very fine, fine, and medium pores; 15 percent pebbles; neutral (pH 6.6); gradual wavy boundary.

C-60 to 70 inches; yellowish brown (10YR 5/4) gravelly loamy coarse sand, dark yellowish brown (10YR 4/4) moist; single grain; loose, nonsticky and nonplastic; few medium roots; few very fine and fine pores; 15 percent pebbles; neutral (pH 6.6).

Type location: Just off Forest Service Road No. 3N44; 1,980 feet east and 1,100 feet north of the southwest corner of sec. 13, T. 5 S., R. 1 E., Hemet NE. Quadrangle.

Range in characteristics: The mean annual soil temperature at a depth of 20 inches is 59 to 68 degrees F. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 10YR 5/4, 5/3 or 4/4; it has moist color of 10YR 4/3, 4/2 or 3/3. Moist value of less than 4 is confined to the upper 3 inches. The A horizon is loam or sandy loam and is 0 to 35 percent rock fragments.

The B2t horizon has dry color of 10YR 4/4, 5/4, or 6/4 or of 7.5YR 5/4; it has moist color of 10YR 4/3 or 5/4 or of 7.5YR 4/4. It is loam or sandy clay loam and is 0 to 20 percent rock fragments.

The C horizon has dry color of 10YR 7/4, 6/4, 6/8, or 5/4 or of 2.5Y 5/4 or 5/6; it has moist color of 10YR 6/4, 5/4, or 4/4 or of 2.5Y 5/4 or 4/4. It is sandy loam, loamy sand, or loamy coarse sand and is 0 to 20 percent rock fragments. This horizon grades to soft, weakly consolidated alluvium.

Vegetation: chamise, manzanita, ceanothus, sagebrush, buckwheat, yerba santa, yucca, annual grasses, and minor areas of coastal sage.

RUCH FAMILY

The Ruch family consists of very deep, well drained soils that formed in alluvium weathered from granitic and metamorphic rock. They are on alluvial fans and terraces at elevations of 3,800 to 6,600 feet. Slopes range from 2 to 25 percent. Annual precipitation is 20 to 30 inches.

Taxonomic class: These soils are fine-loamy, mixed, mesic Typic Haploxeralfs.

Typical pedon of the Ruch family is in a unit of Oak Glen-Ruch families complex, 2 to 15 percent slopes under Jeffrey pine and canyon live oak on an alluvial fan at an elevation of 4,740 feet and slope of 10 percent.

A11-0 to 2 inches; dark yellowish brown (10YR 4/4) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; many very fine and common fine and medium roots; common very fine and fine pores; slightly acid (pH 6.2); clear wavy boundary.

A12-2 to 9 inches; pale brown (10YR 6/3) loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine and fine pores; slightly acid (pH 6.4); clear wavy boundary.

B2t-9 to 23 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, firm, sticky and slightly plastic; common thin clay films on faces of peds; few fine roots; common very fine and fine pores; 5 percent cobbles; neutral (pH 6.6); gradual wavy boundary.

B3t-23 to 32 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very firm, slightly sticky and nonplastic; few thin clay films on faces of peds; few fine roots; common very fine and fine pores; 5 percent cobbles; neutral (pH 6.6); gradual wavy boundary.

C-32 to 60 inches; light yellowish brown (10YR 6/4) gravelly loamy sand, yellowish brown (10YR 5/4) moist; massive; slightly hard, firm, nonsticky and nonplastic; few fine roots; common very fine and fine pores; 15 percent pebbles; neutral (pH 6.6).

Type location: Southwest of Highway 74 and Pine Meadow; 750 feet west and 1,000 feet south of the northeast corner of sec. 1, T. 7 S., R. 3 E., Idyllwild 15-minute Quadrangle.

Range in characteristics: The mean annual soil temperature at a depth of 20 inches is 47 to 59 degrees F. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 10YR 4/2, 4/4, 5/2, 5/3, 6/4, or 6/3; it has moist color of 10YR 3/2, 3/3, 4/2, 4/3, 4/4, 5/3, or 5/4. Moist chroma of less than 4 is confined to the A11 horizon. The A horizon is sandy loam or loam and is 0 to 25 percent rock fragments.

The B2t horizon has dry color of 10YR 5/4, 6/3, 6/4, 6/6, or 7/4; it has moist color of 10YR 4/4, 5/4, 5/6, or 6/4. It is loam, clay loam, or sandy clay loam and is 0 to 15 percent rock fragments.

The C horizon has dry color of 10YR 5/4, 6/4, or 6/8; it has moist color of 10YR 4/4, 5/3, 5/4, 5/6, or 5/8. It is coarse sandy loam or loamy coarse sand and is 5 to 50 percent rock fragments.

Vegetation: Coulter pine, ponderosa pine, Jeffrey pine, canyon live oak, chamise, ceanothus, manzanita, mountain mahogany, buckwheat, and annual grasses.

SAN ANDREAS FAMILY

The San Andreas family consists of moderately deep, well drained soils that formed in material weathered from granitic and metamorphic rock. They are on hills and mountainsides at elevations of 2,400 to 4,500 feet. Slopes range from 15 to 40 percent. Annual precipitation is 15 to 25 inches.

Taxonomic class: These soils are coarse-loamy, mixed, thermic Typic Haploxerolls.

Typical pedon of the San Andreas family is in a unit of San Andreas-Osito-Modesto families complex, 15 to 50 percent slopes under ceanothus and scrub oak on a north-facing hillside at an elevation of 4,000 feet and slope of 30 percent.

A1-0 to 1 inch; brown (10YR 4/3) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine and fine pores; 10 percent pebbles; neutral (pH 7.0); gradual wavy boundary.

A3-1 inch to 7 inches; brown (10YR 4/3) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine and fine pores; 15 percent pebbles; neutral (pH 7.0); clear wavy boundary.

B2-7 to 15 inches; yellowish brown (10YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, firm, slightly sticky and nonplastic; common very fine, fine, and medium roots; many very fine and fine and common medium pores; 5 percent pebbles; slightly acid (pH 6.5); gradual wavy boundary.

C1-15 to 22 inches; brownish yellow (10YR 6/6) gravelly sandy loam, dark brown (7.5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few fine and medium roots; common very fine and fine and few medium pores; 20 percent pebbles; slightly acid (pH 6.5); clear irregular boundary.

C2r-22 inches; highly weathered fractured metamorphic rock; difficult to dig; fractures are 2 to 4 inches apart and 1/2 inch to 1 1/2 inches wide; sandy loam material in fractures; rock is coated with clay in some of the fractures.

Type location: About one-half mile east of forest boundary along the main road to Harley Flat; 130 feet west and 800 feet north of the center of sec. 31, T. 3 S., R. 2 E., Lake Fulmor Quadrangle.

Range in characteristics: Depth to paralithic contact is 20 to 40 inches. The mean annual soil temperature at 20 inches is 59 to 68 degrees F. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3). It is 0 to 35 percent rock fragments.

The A horizon has dry color of 10YR 5/2, 5/3, 4/3, or 3/4; it has moist color of 10YR 3/3 or 3/2 or of 7.5YR 3/2. It is sandy loam or coarse sandy loam.

The B horizon has dry color of 10YR 6/4 or 5/4 or of 7.5YR 5/4; it has moist color of 10YR 5/4 or 4/3 or of 7.5YR 4/4. It is sandy loam or coarse sandy loam.

The C horizon has dry color of 10YR 6/6 or 6/4; it has moist color of 10YR 4/4 or of 7.5YR 4/4. It is sandy loam or loamy sand.

Vegetation: chamise, scrub oak, manzanita, buckwheat, ceanothus, yucca, and annual grasses.

SOBOBA FAMILY

The Soboba family consists of very deep, excessively drained soils that formed in recent alluvium weathered from granitic and metamorphic rock. They are on flood plains, along drainageways, and on some alluvial fans at elevations of 1,600 to 4,000 feet. Slopes range from 2 to 15 percent. Annual precipitation is 15 to 25 inches.

Taxonomic class: These soils are sandy-skeletal, mixed, thermic Typic Xerofluvents.

Typical pedon of the Soboba family is in a unit of Soboba-Hanford families association, 2 to 15 percent slopes under chamise, manzanita, and buckwheat on a flood plain at an elevation of 3,600 feet and slope of 5 percent.

A11-0 to 3 inches; brown (10YR 4/3) very cobbly loamy sand, dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and few medium roots; many very fine and fine pores; 15 percent pebbles and 20 percent cobbles; neutral (pH 7.2); clear smooth boundary.

A12-3 to 8 inches; light olive brown (2.5Y 5/4) very cobbly sand, olive brown (2.5Y 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine pores; 20 percent pebbles and 15 percent cobbles; neutral (pH 7.2); abrupt smooth boundary.

C1-8 to 24 inches; grayish brown (2.5Y 5/2) very cobbly sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine pores; 10 percent pebbles and 35 percent cobbles; neutral (pH 7.0); gradual wavy boundary.

IIC2-24 to 60 inches; stratified yellowish brown (10YR 5/4) very cobbly loamy fine sand and sand, dark yellowish brown (10YR 4/4) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; few very fine pores; 20 to 30 percent pebbles and 20 to 30 percent cobbles; neutral (pH 7.0).

Type location: 2,600 feet west and 600 feet north of the southeast corner of sec. 14, T. 3 N., R. 6 W., Cajon Quadrangle.

Range in characteristics: The mean annual soil temperature at a depth of 20 inches is 59 to 68 degrees F. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3). It is 35 to 70 percent rock fragments.

The A horizon has dry color of 2.5Y 5/4 or 6/2 or of 10YR 4/1, 4/2, 4/3, 5/2, or 5/3; it has moist color of 2.5Y 3/2, 4/2, or 4/4 or of 10YR 3/1, 3/2, or 3/3. It is coarse sandy loam, loamy fine sand, or loamy sand.

The C horizon has dry color of 2.5Y 5/2 or 6/2 or of 10YR 5/2, 5/4, 6/2, or 6/3; it has moist color of 10YR 4/2, 4/3, 4/4, 5/2, or 5/3 or of 2.5Y 4/2. It is stratified loamy fine sand, loamy sand, loamy coarse sand, or sand.

Vegetation: chamise, manzanita, ceanothus, yerba santa, buckwheat, and yucca. In riparian areas: sycamore and cottonwood.

SPRINGDALE FAMILY

The Springdale family consists of moderately deep to deep, somewhat excessively drained soils that formed in material weathered from granitic or metamorphic rocks. They are on mountainsides at elevations of 3,000 to 7,500 feet. Slopes range from 30 to 75 percent. Annual precipitation is 15 to 35 inches.

Taxonomic class: These soils are sandy-skeletal, mixed, mesic Typic Xerorthents.

Typical pedon of the Springdale family in an area of Springdale family-Lithic Xerorthents association, dry, 50 to 75 percent slopes under chamise, manzanita, and scrub oak on a south-facing mountainside at an elevation of 4,200 feet and slope of 60 percent.

A1-0 to 5 inches; brown (10YR 5/3) gravelly loamy coarse sand, dark brown (10YR 3/3) moist; weak medium granular structure; soft, friable, nonsticky and nonplastic; many very fine and fine roots and few medium roots; many very fine and fine interstitial pores; 20 percent pebbles; neutral (pH 7.3); gradual irregular boundary.

C1-5 to 25 inches; pale brown (10YR 6/3) very gravelly loamy sand, yellowish brown (2.5Y 5/4) moist; single grain; loose, nonsticky and nonplastic; many very fine and fine roots and few medium roots; many fine interstitial pores; 45 percent pebbles; neutral (pH 7.0); gradual irregular boundary.

C2-25 to 45 inches; very pale brown (10YR 7/3) very gravelly coarse sand, light yellowish brown (10YR 6/4) moist; single grain; loose, nonsticky and nonplastic; common fine and few medium and coarse roots; common fine pores; 50 percent pebbles; neutral (pH 7.0); clear wavy boundary.

R-45 inches; slightly weathered fractured granite; fractures are 1/4 to 3/4 inch wide and less than 10 inches apart; roots in fractures.

Type location: North of Lone Pine Canyon near Sharpless Ranch; 1,900 feet west and 500 feet south of the northeast corner of sec. 32, T. 3 N., R. 6 W., Telegraph Peak Quadrangle.

Range in characteristics: Depth to lithic contact is 20 to 50 inches. The mean annual soil temperature at a depth of 20 inches commonly is 47 to 54 degrees F, or 54 to 59 degrees F where the dry phase is mapped. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October, or from early in May to late in October in areas where the dry phase is mapped, and moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 10YR 4/3, 4/4, 5/3, 5/4, or 6/3 or of 2.5Y 5/4; it has moist color of 10YR 3/2, 3/3, 4/3, 4/4, or 5/4 or of 2.5Y 4/4. It is sandy loam or loamy sand and is 10 to 50 percent rock fragments.

The C horizon has dry color of 10YR 5/3, 5/4, 5/6, 6/3, 6/4, 6/6 or 7/3 or of 2.5Y 5/2, 5/4, 5/6, 6/4, or 6/6; it has moist color of 10YR 4/2, 4/3, 4/4, 5/4, 5/6, or 6/4 or of 2.5Y 5/2 or 5/4. It is loamy sand, loamy coarse sand, loamy fine sand, or coarse sand and is 35 to 80 percent rock fragments.

Vegetation: Jeffrey pine, ponderosa pine, Coulter pine, black oak, sugar pine, and white fir; bigcone Douglas-fir, canyon live oak, ceanothus, pinyon pine, chamise, manzanita, and scrub oak where mapped as the dry unit.

SWITCHBACK FAMILY

The Switchback family consists of moderately deep, well drained soils that formed in material weathered from granitic and metamorphic rocks. They are on hillsides at elevations of 7,000 to 9,000 feet. Slopes range from 15 to 30 percent. Annual precipitation is 25 to 40 inches.

Taxonomic class: These soils are coarse-loamy, mixed, frigid Typic Xerochrepts.

Typical pedon of the Switchback family is in a unit of Merkel-Switchback families complex, 15 to 30 percent slopes under Jeffrey pine and juniper on a south-facing hillside at an elevation of 8,200 feet and slope of 30 percent.

A1-0 to 5 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine and few medium roots; many very fine and fine pores; neutral (pH 7.0); clear smooth boundary.

B2-5 to 24 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and fine roots; many very fine and fine pores; slightly acid (pH 6.5); clear wavy boundary.

C1-24 to 30 inches; yellowish brown (10YR 5/4) coarse sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine pores; neutral (pH 7.0); gradual wavy boundary.

C2r-30 inches; highly weathered granite; original rock structure apparent; no roots.

Type location: About 800 feet due north of Coon Creek Jumpoff; 2,000 feet east and 600 feet north of the southwest corner of sec. 19, T. 1 N., R. 3 E., Onyx Peak Quadrangle.

Range in characteristics: Depth to paralithic contact is 20 to 40 inches. The mean annual soil temperature at a depth of 20 inches is 42 to 47 degrees F. The soil moisture control section is estimated usually to be dry in all parts from early in June to late in October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3). It is 0 to 25 percent rock fragments.

The A horizon has dry color of 10YR 4/3 or 5/3; it has moist color of 10YR 3/2 or 4/3. It is loam or sandy loam.

The B horizon has dry color of 10YR 5/4 or 6/4; it has moist color of 10YR 4/4 or 5/4. It is loam or sandy loam.

The C horizon has dry color of 10YR 5/4 or of 2.5Y 5/4; it has moist color of 10YR 4/4 or of 2.5Y 4/4. It is coarse sandy loam or sandy loam.

Vegetation: manzanita, mountain mahogany, Jeffrey pine, white fir, ponderosa pine, lodgepole pine, juniper, and mountain whitethorn.

TOLLHOUSE FAMILY

The Tollhouse family consists of shallow, somewhat excessively drained soils that formed in material weathered from granitic and metamorphic rock. They are on mountainsides at elevations of 3,400 to 5,600 feet. Slopes range from 30 to 75 percent. Annual precipitation is 15 to 25 inches.

Taxonomic class: These soils are loamy, mixed, mesic, shallow Entic Haploxerolls.

Typical Pedon of the Tollhouse family is in a unit of Tyee-Tollhouse families complex, 30 to 50 percent slopes under chamise, manzanita, and ceanothus on a southeast-facing mountainside at an elevation of 5,600 feet and slope of 35 percent.

O1-1 inch to 0; partly decomposed leaves and annual grasses.

A1-0 to 11 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine interstitial pores; 20 percent pebbles; neutral (pH 7.0); clear smooth boundary.

C1-11 to 18 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common very fine and fine pores; 10 pebbles; neutral (pH 7.0); abrupt wavy boundary.

C2r-18 inches; highly weathered granite; no roots.

Type location: 3,000 feet south and 3,300 feet east of the northwest corner of sec. 32, T. 1 N., R. 1 W., Keller Peak Quadrangle.

Range in characteristics: Depth to paralithic contact is 10 to 20 inches. The mean annual soil temperature at the contact is 47 to 59 degrees F. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3). It is 0 to 35 percent rock fragments.

The A horizon has dry color of 10YR 3/2, 4/2, 5/2, or 5/3; it has moist color of 10YR 2/2, 3/2, or 3/3. It is loam, sandy loam, or coarse sandy loam.

The C horizon has dry color of 10YR 4/2, 5/3, 5/4, 6/3, or 7/3; it has moist color of 10YR 3/2, 3/3, 4/3, 4/4, or 5/4. It is sandy loam or coarse sandy loam.

Vegetation: chamise, manzanita, mountain mahogany, ceanothus, and annual grasses.

TRIGO FAMILY

The Trigo family consists of shallow, somewhat excessively drained soils that formed in material weathered from granitic and metamorphic rocks or sandstone. They are on hills and mountainsides at elevations of 1,600 to 6,400 feet. Slopes range from 15 to 75 percent. Annual precipitation is 10 to 20 inches.

Taxonomic class: These soils are loamy, mixed, nonacid, thermic, shallow Typic Xerorthents.

Typical pedon of the Trigo family is in a unit of Trigo family-Lithic Xerorthents, warm complex, 30 to 50 percent slopes under chamise, manzanita, and buckwheat on a southeast-facing mountainside at an elevation of 3,000 feet and slope of 35 percent.

O1-2 inches to 0; partly decomposed leaves and grass.

A1-0 to 3 inches; yellowish brown (10YR 5/4) coarse sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine pores; 5 percent pebbles; slightly acid (pH 6.5); clear smooth boundary.

C1-3 to 12 inches; yellowish brown (10YR 5/4) coarse sandy loam, dark yellowish brown (10YR 4/4) moist; massive; hard, very friable, nonsticky and nonplastic; common very fine and fine roots; common very fine and fine pores; 10 percent pebbles; slightly acid (pH 6.5); clear smooth boundary.

C2r-12 inches; highly weathered granite; breaks down to individual mineral grains; no roots.

Type location: 3,300 feet west and 1,600 feet north of the southeast corner of sec. 32, T. 2 N., R. 6 W., Devore Quadrangle.

Range in characteristics: Depth to paralithic contact is 10 to 20 inches. The mean annual soil temperature at the contact is 59 to 70 degrees F. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October and to be moist in some or all parts during the rest of the year. The profile is sandy loam, coarse sandy loam, or very fine sandy loam and is 0 to 35 percent rock fragments. It is slightly acid to neutral (pH 6.1 to 7.3).

Very fine sandy loam textures are confined to areas where the soil formed in material weathered from fine-grained sandstone.

The A horizon has dry color of 10YR 4/2, 4/3, 5/2, 5/3, or 5/4; it has moist color of 10YR 3/1, 3/3, 4/2, 4/3, 4/4, or 5/3.

The C horizon has dry color of 10YR 5/4, 6/3, or 6/4 or of 2.5Y 5/2, 6/4, or 7/4; it has moist color of 10YR 4/3, 4/4, or 5/4 or of 2.5Y 4/2, 4/4, or 5/4.

Vegetation: chamise, manzanita, ceanothus, yucca, pinyon pine, buckwheat, juniper, scrub oak, interior live oak, redshanks (San Jacinto Mts.), and annual grasses.

TYEE FAMILY

The Tyee family consists of shallow, somewhat excessively drained soils that formed in material weathered from granitic and metamorphic rock. They are on mountainsides at elevations of 3,400 to 5,600 feet. Slopes range from 30 to 75 percent. Annual precipitation is 15 to 25 inches.

Taxonomic class: These soils are loamy, mixed, nonacid, mesic, shallow Typic Xerorthents.

Typical pedon of the Tyee family is in a unit of Tyee-Tollhouse families complex, 30 to 50 percent slopes under chamise, manzanita, and ceanothus on a north-facing mountainside at an elevation of 3,800 feet and slope of 40 percent.

O1-1/2 inch to 0; partly decomposed leaves and annual grasses.

A1-0 to 4 inches; dark brown (10YR 4/3) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine continuous tubular pores; 15 percent pebbles; neutral (pH 7.0); clear smooth boundary.

C1-4 to 11 inches; light yellowish brown (10YR 6/4) gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, slightly sticky and nonplastic; few very fine and fine roots; common very fine and fine continuous interstitial pores; 20 percent pebbles; neutral (pH 7.0); clear smooth boundary.

C2-11 to 15 inches; light yellowish brown (10YR 6/4) coarse sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; few very fine and fine continuous tubular pores; slightly acid (pH 6.5); clear smooth boundary.

C3r-15 inches; highly weathered granite.

Type location: 2,600 feet east and 2,000 feet south of the northwest corner of sec. 33, T. 1 N., R. 1 W., Big Bear Lake Quadrangle.

Range in characteristics: Depth to paralithic contact is 10 to 20 inches. The mean annual soil temperature at the contact is 47 to 59 degrees F. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 10YR 4/2, 4/3, 5/2, or 5/3; it has moist color of 10YR 3/2, 3/3, 4/2, or 4/3. It is coarse sandy loam or sandy loam and is 0 to 30 percent rock fragments.

The C horizon has dry color of 10YR 5/3, 5/4, 6/4, 7/3, or 7/4; it has moist color of 10YR 4/3, 4/4, 5/2, 5/4, 6/3, or 6/4. It is coarse sandy loam or sandy loam and is 0 to 15 percent rock fragments.

Vegetation: chamise, manzanita, ceanothus, scrub oak, yerba santa, buckwheat, and annual grasses and forbs.

TYPIC HAPLOXERALFS

Typic Haploxeralfs consist of moderately deep to deep, well drained soils that formed in material weathered from soft weakly consolidated sedimentary rock. They are on smooth linear side slopes of dissected terraces at elevations of 2,000 to 4,000 feet. Slopes range from 30 to 50 percent. Annual precipitation is 10 to 25 inches.

In a representative profile of this subgroup the surface layer is brown (10YR 5/3) gravelly loam 2 inches thick with a litter layer 1/4 inch thick of undecomposed leaves. The subsoil is in two parts. The upper 8 inches is light yellowish brown (10YR 6/4) gravelly sandy clay loam, and the lower 12 inches is light yellowish brown (10YR 6/4) loam. The substratum, to a depth of 40 inches, is very pale brown (10YR 7/4) gravelly sandy loam. Below this is soft, weakly consolidated sandstone.

Depth to soft, weakly consolidated sedimentary rock is 20 to 50 inches. The surface layer is loam or sandy loam, the subsoil is loam or sandy clay loam, and the substratum is sandy loam, coarse sandy loam, or loamy sand. Rock fragment content, mainly pebbles and cobbles, is 5 to 35 percent.

The mean annual soil temperature at a depth of 20 inches is 59 to 70 degrees F. The soil moisture control section is estimated usually to be dry from late in May to early in November and moist in some or all parts during the rest of the year.

Vegetation: chamise, ceanothus, manzanita, buckwheat, yucca, juniper, scrub oak, pinyon pine, and minor areas of coastal sage.

TYPIC XERORTHENTS

Typic Xerorthents consist of very deep, somewhat excessively drained and excessively drained soils that formed in alluvium weathered from granite and metamorphic rock. They are on inface bluffs (Baldy Mesa), terrace escarpments (Santa Ana Canyon), and old fan deposits (Garner Valley). Where mapped as the warm phase, Typic Xerorthents consist of shallow and moderately deep, somewhat excessively drained and excessively drained soils that formed in material weathered from soft weakly consolidated sedimentary rock. They are on ridge crests and upper side slopes of dissected terraces (Cajon Pass area) at elevations of 2,000 to 6,600 feet. Slopes range from 10 to 75 percent. Annual precipitation is 8 to 30 inches.

In a representative profile of this subgroup the surface layer is brown (10YR 5/3) gravelly loam 4 inches thick. The substratum to a depth of 60 inches is in two parts. The upper 16 inches is pale brown (10YR 6/3) very cobbly sandy loam. Below this is pale brown (10YR 6/3) extremely cobbly loamy sand.

The profile is loam and is 0 to 20 percent rock fragments or it is sandy loam or loamy sand and is 0 to 75 percent rock fragments. Where the warm phase is mapped, depth to soft weakly consolidated sedimentary material is 10 to 40 inches.

The mean annual soil temperature at a depth of 20 inches is 47 to 59 degrees F. Where the warm phase is mapped, the mean annual soil temperature at the contact or at a depth of 20 inches is 59 to 70 degrees F. The soil moisture control section is estimated usually to be dry in all parts from late in June to late in October and moist in some or all parts during the rest of the year. Where the warm phase is mapped, the soil moisture control section is estimated usually to be dry from late in May to early in November and moist in some or all parts during the rest of the year.

Vegetation: chamise, ceanothus, manzanita, redshanks (San Jacinto Mts.), buckwheat, yerba santa, and yucca.

WAPAL FAMILY

The Wapal family consists of moderately deep to deep, somewhat excessively drained soils that formed in material weathered from granitic rock. They are on mountainsides at elevations of 6,500 to 10,500 feet. Slopes range from 15 to 65 percent. Annual precipitation is 30 to 40 inches.

Taxonomic class: These soils are sandy-skeletal, mixed, frigid Typic Xerorthents.

Typical pedon of the Wapal family is in a unit of Wapal family-Lithic Xerorthents, cool association, 50 to 75 percent slopes under sugar pine, white fir, and Jeffrey pine on a north-facing mountainside at an elevation of 7,300 feet and slope of 60 percent.

A1-0 to 3 inches; light olive brown (2.5Y 5/4) very gravelly sandy loam, olive brown (2.5Y 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; many very fine and fine pores; 50 percent pebbles; slightly acid (pH 6.4); gradual wavy boundary.

C1-3 to 27 inches; light yellowish brown (10YR 6/4) very gravelly loamy sand, dark yellowish brown (10YR 4/4) moist; single grain; loose, nonsticky and nonplastic; common fine and medium roots and few coarse roots; many fine and few medium pores; 50 percent pebbles; slightly acid (pH 6.2); gradual wavy boundary.

C2-27 to 40 inches; light yellowish brown (2.5Y 6/4) extremely gravelly loamy sand, light olive brown (2.5Y 5/4) moist; single grain; loose, nonsticky and nonplastic; few fine roots and common medium roots; common fine and few medium pores; 50 percent pebbles and 15 percent cobbles; slightly acid (pH 6.3); gradual wavy boundary.

R-40 inches; highly fractured granite; fractures are 1/4 to 1 inch wide and 3 to 4 inches apart; roots in fractures.

Type location: Gunsight Pass, off Raywood Flat Road; 660 feet west and 2,300 feet north of the southeast corner of sec. 36, T. 1 S., R. 1 E., San Gorgonio Mountain Quadrangle.

Range in characteristics: Depth to lithic contact is 20 to 60 inches. The mean annual soil temperature at a depth of 20 inches is 40 to 47 degrees F. The soil moisture control section is estimated usually to be dry in all parts from late in June to late in October and moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3). It is 35 to 70 percent rock fragments.

The A horizon has dry color of 2.5Y 5/4 or of 10YR 5/4, 4/3, or 4/4; it has moist color of 2.5Y 4/4 or of 10YR 3/3 or 4/2. It is sandy loam or loamy sand.

The C horizon has dry color of 2.5Y 5/4 or 6/4 or of 10YR 5/4, 6/4, or 6/6; it has moist color of 2.5Y 4/4 or 5/4 or of 10YR 4/4 or 5/4. It is loamy sand or sand.

Vegetation: white fir, sugar pine, Jeffrey pine, ponderosa pine, lodgepole pine, limber pine, and chinquapin.

WAPI FAMILY

The Wapi family consists of shallow, somewhat excessively drained soils that formed in material weathered from granitic rock. They are on hills and mountainsides at elevations of 3,600 to 8,000 feet. Slopes range from 15 to 75 percent. Annual precipitation is 10 to 35 inches.

Taxonomic class: These soils are mixed, mesic Lithic Xeropsamments.

Typical pedon of the Wapi family is in a unit of Wapi-Pacifico families, dry-Rock outcrop complex, 50 to 75 percent slopes under chamise, manzanita, and ceanothus on a south-facing mountainside at an elevation of 5,300 feet and slope of 50 percent.

A1-0 to 2 inches; grayish brown (10YR 5/2) gravelly loamy sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; common fine roots; many very fine and fine pores; 20 percent pebbles; slightly acid (pH 6.5); clear smooth boundary.

C1-2 to 13 inches; pale brown (10YR 6/3) gravelly loamy sand, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few fine, medium, and coarse roots; common very fine and fine and few medium pores; 20 percent pebbles; slightly acid (pH 6.5); clear smooth boundary.

C2r-13 to 15 inches; highly weathered granite that breaks down to a very gravelly coarse sand.

R-15 inches; hard, fractured granite.

Type location: 1,650 feet east and 1,300 feet south of the northwest corner of sec. 33, T. 4 S., R. 2 E., Lake Fulmor Quadrangle.

Range in characteristics: Depth to lithic contact is 10 to 20 inches. The mean annual soil temperature at the contact is 47 to 54 degrees F or 54 to 59 degrees F where the dry phase is mapped. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October, or from late in May to mid-November where the dry phase is mapped, and moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3). It is 0 to 35 percent rock fragments.

The A horizon has dry color of 10YR 4/2, 4/3, 5/2, 5/3, or 6/3 or of 2.5Y 5/2; it has moist color of 10YR 3/2, 3/3, 4/2, or 4/3 or of 2.5Y 3/2. It is coarse sandy loam, loamy coarse sand, or loamy sand.

The C horizon has dry color of 10YR 5/3, 6/3, or 6/4 or of 2.5Y 6/4; it has moist color of 10YR 5/2, 4/3, or 6/4 or of 2.5Y 4/4 or 5/4. It is loamy coarse sand or loamy sand.

Vegetation: white fir, sugar pine, mountain whitethorn, manzanita, and annual grasses; chamise, manzanita, ceanothus, redshanks (San Jacinto Mts.), interior live oak, juniper, scrub oak, and pinyon pine where mapped as the dry phase.

WILSHIRE FAMILY

The Wilshire family consists of very deep, somewhat excessively drained soils that formed in mixed alluvium weathered from granitic and metamorphic rocks. They are on flood plains and in drainageways at elevations of 3,800 to 6,000 feet. Slopes range from 2 to 10 percent. Annual precipitation is 10 to 25 inches.

Taxonomic class: These soils are sandy-skeletal, mixed, mesic Typic Xerofluvents.

Typical pedon of the Wilshire family is in a unit of Wilshire-Oak Glen, dry families association, 2 to 15 percent slopes under canyon live oak and manzanita on a flood plain at an elevation of 4,000 feet and slope of 2 percent.

A1-0 to 5 inches; light brownish gray (2.5Y 6/2) very gravelly coarse sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; many very fine and fine pores; 40 percent pebbles and 10 percent cobbles; neutral (ph 7.0); clear wavy boundary.

C1-5 to 15 inches; light brownish gray (2.5Y 6/2) extremely cobbly coarse sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; few fine, medium, and coarse roots; many very fine and fine pores; 30 percent pebbles and 30 percent cobbles; slightly acid (pH 6.5); clear irregular boundary.

IIC2-15 to 22 inches; grayish brown (2.5Y 5/2) loamy fine sand, very dark grayish brown (2.5Y 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; many very fine and fine pores; 5 percent pebbles; slightly acid (pH 6.5); clear irregular boundary.

IIIC3-22 to 60 inches; light brownish gray (2.5Y 6/2) very gravelly coarse sand, dark brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; few fine roots; many very fine pores; 50 percent pebbles and 5 percent cobbles; neutral (pH 7.0).

Type location: About 100 feet south of where the Banning Canyon Road crosses the San Gorgonio River; 1,800 feet east and 1,550 feet north of the southwest corner of sec. 8, T. 2 S., R. 1 E., Forest Falls Quadrangle.

Range in characterictics: The mean annual soil temperature at a depth of 20 inches is 47 to 59 degrees F. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October and to be moist in some or all parts during the rest of the year. These soils are commonly subject to brief flooding during December through March. The profile is loamy sand, loamy coarse sand, sand, or coarse sand and is 5 to 60 percent rock fragments, but the weighted average is at least 35 percent between depths of 10 and 40 inches. The profile is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 5Y 5/1, 6/1, 6/2, or 5/2, of 2.5Y 6/2, or of 10YR 6/3, 5/2, 5/3, or 4/3; it has moist color of 5Y 3/1, 4/1, or 5/2, of 2.5Y 4/2, or of 10YR 5/3, 4/3, 4/2, or 3/3.

The C horizon has dry color of 5Y 6/2, 6/1, 5/2, or 5/1, of 2.5Y 6/2, 5/2, or 3/2, or of 10YR 6/3, 5/3, 5/2, or 4/3; it has moist color of 5Y 5/2, 4/2, or 4/1, of 2.5Y 4/2, or of 10YR 4/3 or 4/2.

Vegetation: Coulter pine, canyon live oak, ceanothus, mountain mahogany, manzanita, sugar sumac, buckwheat, Joshua tree, and annual grasses.

WIND RIVER FAMILY

The Wind River family consists of moderately deep to deep, well drained soils that formed in material weathered from granitic rock. They are on hills and mountainsides at elevations of 4,000 to 6,600 feet. Slopes range from 5 to 50 percent. Annual precipitation is 20 to 35 inches.

Taxonomic class: These soils are coarse-loamy, mixed, mesic Ultic Haploxerolls.

Typical pedon of the Wind River family in a unit of Morical-Wind River families complex, 15 to 30 percent slopes under Jeffrey pine and black oak on a hillside at an elevation of 5,000 feet and slope of 15 percent.

A1-0 to 5 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots; many very fine and fine pores; neutral (pH 7.0); clear wavy boundary.

A3-5 to 19 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak very fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few fine, medium, and coarse roots; many very fine and fine pores; neutral (pH 7.0); gradual irregular boundary.

B2-19 to 34 inches; light yellowish brown (10YR 6/4) sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, firm, nonsticky and nonplastic; few fine and medium roots; common very fine and fine pores; slightly acid (pH 6.5); clear wavy boundary.

C1-34 to 45 inches; very pale brown (10YR 7/3) sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; few fine and medium roots; common very fine and fine and few medium pores; neutral (pH 6.7); abrupt wavy boundary.

C2r-45 inches; highly weathered granite.

Type location: About 650 feet east and 2,000 feet north of the southwest corner of sec. 14, T. 5 S., R. 2 E., Hemet NE. Quadrangle.

Range in characterictics: Depth to paralithic contact is 20 to 55 inches. The mean annual soil temperature at a depth of 20 inches is 50 to 59 degrees F. The soil moisture control section is estimated usually to be dry in all parts from early in June to mid-October and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 10YR 5/3, 5/2, 4/3, 3/3, or 4/2; it has moist color of 10YR 3/3, 3/2, or 2/2. It is coarse sandy loam or sandy loam and is 0 to 15 percent rock fragments. In some pedons it is loamy coarse sand in the upper 2 to 4 inches.

The B horizon has dry color of 10YR 6/4, 5/4, or 5/3 or of 2.5Y 6/4 or 5/4; it has moist color of 10YR 4/4 or 4/3 or of 2.5Y 4/4. It is loam, sandy loam, or coarse sandy loam and is 0 to 35 percent rock fragments.

The C horizon has dry color of 10YR 7/3, 6/4, or 5/6 or of 2.5Y 7/2 or 5/2; it has moist color is 10YR 5/4, 4/4, or 4/3 or of 2.5Y 7/4, 6/4, or 4/2. It is coarse sandy loam or sandy loam and is 0 to 45 percent rock fragments.

Vegetation: Coulter pine, canyon live oak, ponderosa pine, Jeffrey pine, incense-cedar, black oak, sugar pine, and annual grasses.

WINTHROP FAMILY

The Winthrop family consists of moderately deep, somewhat excessively drained soils that formed in material weathered from granitic and metamorphic rock. They are on mountainsides at elevations of 4,000 to 7,000 feet. Slopes range from 50 to 75 percent. Annual precipitation is 20 to 35 inches.

Taxonomic class: These soils are sandy-skeletal, mixed, mesic Entic Haploxerolls.

Typical pedon of the Winthrop family is in a unit of Springdale-Winthrop families complex, 50 to 75 percent slopes under canyon live oak on a north-facing mountainside at an elevation of 6,000 feet and slope of 50 percent.

O1-1 inch to 0; pine needle litter.

A1-0 to 10 inches; brown (10YR 5/3) very gravelly loamy coarse sand, very dark grayish brown (10YR 3/2) moist; single grain; loose, nonsticky and nonplastic; many very fine roots; many very fine and fine interstitial pores; 40 percent pebbles; slightly acid (pH 6.5); clear smooth boundary.

C1-10 to 26 inches; yellowish brown (10YR 5/4) very gravelly loamy coarse sand, dark brown (10YR 4/3) moist; massive; soft, friable, nonsticky and nonplastic; common fine roots and few medium roots; few very fine interstitial pores; 45 percent pebbles; slightly acid (pH 6.5); clear smooth boundary.

C2r-26 inches; highly weathered granite; original rock structure apparent; no roots.

Type location: 1,300 feet east and 1,000 feet north of the southwest corner of sec. 35, T. 3 N., R. 7 W., Telegraph Peak Quadrangle.

Range in characterictics: Depth to paralithic or lithic contact is 20 to 40 inches. The mean annual soil temperature at a depth of 20 inches is 47 to 54 degrees F. The soil moisture control section is estimated usually to be dry in all parts from mid-June to late in October and to be moist in some or all parts during the rest of the year. The profile is loamy sand or loamy coarse sand and is 35 to 60 percent rock fragments. Reaction is slightly acid to neutral (pH 6.1 to 7.3).

The A horizon has dry color of 10YR 4/3, 4/4, 5/3, or 5/4; it has moist color of 10YR 3/2, 3/3, or 2/2.

The C horizon has dry color of 10YR 5/3, 5/4, 6/4, or 6/6; it has moist color of 10YR 4/3, 4/4, or 5/4.

Vegetation: ponderosa pine, black oak, canyon live oak, Jeffrey pine, Coulter pine, incense-cedar, mountain whitethorn, and mountain mahogany.

WRIGHTWOOD FAMILY

The Wrightwood family consists of very deep, well drained soils that formed in alluvium weathered from granitic and metamorphic rock. They are on alluvial fans and terraces at elevations of 3,700 to 5,000 feet. Slopes range from 2 to 40 percent. Annual precipitation is 8 to 20 inches.

Taxonomic class: These soils are coarse-loamy, mixed, mesic Typic Haploxeralfs.

Typical pedon of the Wrightwood family in a unit of Morical, dry-Wrightwood family association, 30 to 50 percent slopes under chamise and manzanita on a southwest-facing side slope of a dissected alluvial fan at an elevation of 4,640 feet and slope of 35 percent.

A1-0 to 5 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine granular to subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common very fine and fine pores; neutral (pH 6.8); clear smooth boundary.

B2t-5 to 22 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few thin clay films bridging sand grains; common very fine and fine roots; common very fine and fine pores; neutral (pH 7.0); clear smooth boundary.

B3t-22 to 38 inches; light yellowish brown (10YR 6/4) fine sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, firm, nonsticky and nonplastic; few thin clay films bridging sand grains; few very fine and fine roots; few very fine and fine pores; neutral (pH 7.0); gradual smooth boundary.

C-38 to 60 inches; light yellowish brown (2.5Y 6/4) sandy loam, olive brown (2.5Y 4/4) moist; massive; very hard, very firm, nonsticky and nonplastic; few very fine roots; few very fine pores; neutral (pH 7.0).

Type location: 2,300 feet west and 2,000 feet north of the southeast corner of sec. 25, T. 6 S., R. 3 E., Idyllwild 15-minute Quadrangle.

Range in characteristics: The mean annual soil temperature at a depth of 20 inches is 54 to 59 degrees F. The soil moisture control section is estimated usually to be dry in all parts from late in May to early in November and to be moist in some or all parts during the rest of the year. The profile is slightly acid to neutral (pH 6.1 to 7.3). It is 0 to 35 percent rock fragments.

The A horizon has dry color of 10YR 5/4 or 6/4 and it has moist color of 10YR 4/3 or 4/4. It is coarse sandy loam, sandy loam, or fine sandy loam.

The B2t horizon has dry color of 10YR 5/6, 5/4, 6/6, 6/3, or 6/4 or of 7.5YR 6/6; it has moist color of 10YR 4/2, 4/3, 4/4, 5/4, or 5/6 or of 7.5YR 5/6. It is sandy loam or fine sandy loam. Clay films are few to common and are thin to moderately thick on the faces of peds or bridging the sand grains.

The C horizon has dry color of 2.5Y 6/4 or of 10YR 5/6, 6/4, or 6/6; it has moist color of 2.5Y 4/4 or of 10YR 5/3, 5/4, or 5/6. In the Garner Valley area (San Jacinto R.D.), the parent material consists of poorly sorted cobbles, stones, and boulders. This contrasts significantly with the well-sorted sandy loam or loamy parent material in the Baldy Mesa area (Cajon R.D.).

Vegetation: chamise, manzanita, juniper, scrub oak, redshanks (San Jacinto Mts.), buckwheat, and annual grasses.

Formation of the Soils

This section discusses the factors of soil formation, relates them to the formation of soils in the survey area, and explains the processes of soil formation.

Soil is a mixture of rocks and minerals, organic matter, and water and air, in varying proportions. The factors that cause soils to differ are (1) the physical and chemical composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the biological forces; (4) the relief or lay of the land; and (5) the length of time the forces of development have acted on the soil material. The relative importance of each factor differs from place to place, but generally the interaction of all the factors determines the kind of soil that forms in any given place.

The influences of each soil-forming factor on the soils of the San Bernardino National Forest are briefly discussed in the following paragraphs.

Parent Material

The parent material from which the soils in the survey area have formed is both residual and transported (alluvial). The parent material is the weathered rock or unconsolidated material from which soils form. A diverse range of geological parent materials occurs in the survey area in terms of age and rock types. The residual soils formed in material weathered from granitic and metamorphic rocks and minor areas of sedimentary rock. These soils are shallow to moderately deep and bedrock outcrops occur in many places. The transported alluvial soils formed in alluvium and are very deep.

Climate

Climate has a major influence on the formation of soils in the San Bernardino Survey Area. Climate and vegetation are the active influences on soil formation. Moisture and heat influence the amount and kind of vegetation that grows, the rate at which minerals weather, and the removal of material from the different soil horizons or the accumulation of material in them. They also influence erosion of the soil and accumulation of weathering products.

The summers are hot and dry except in the higher elevations where occasional thunder showers may occur. The winters are cool, and most of the annual precipitation falls between late November and March. By late spring the soils are usually still moist. By late summer the same soils are severely dry. Soil moisture is considered the most limiting factor for plant growth. Annual precipitation ranges from 8 inches on the desert slopes to 40 inches at the highest elevations. Above 7,000 feet, most of the precipitation occurs as snow.

The maritime influence is very important, particularly along the main divide portion of the forest. The desert-facing slopes are strongly influenced by the rain shadow effect. High-intensity winter and summer storms greatly increase the hazard of soil movement and runoff.

Biological Activity

Vegetation is the dominant biological force that affects the formation of soils in the San Bernardino National Forest area. The main effects of vegetation result from the accumulation of organic material in the surface layer and the penetration of roots into the soil. Plants, small animals, insects, bacteria, fungi, and other organisms also add organic matter to the soil, but their contribution to the accumulation of organic matter and cycling of nutrients to the surface soil depends largely on the vegetation that grows on the soil.

The natural vegetation in the San Bernardino National Forest includes grasses, forbs, chaparral, hardwoods, mixed conifers, and riparian species. The chaparral plant community consists of moderately dense to dense stands of evergreen broadleaf shrubs. The hardwood vegetation type includes several species of oak and is found along drainage bottoms and at middle elevations on northern aspects. The mixed conifer type includes pines, bigcone Douglas-fir, white fir, and incense-cedar; it is found primarily above 4,500 feet. The riparian vegetation consists of oaks, alders, sycamore, cottonwood and willows.

The north slopes are protected from direct sunlight. Water utilization by plants is more efficient because evaporation is less. The soils on north exposures support more vegetation. The vegetation adds organic material to the soil and influences the color, structure, and physical condition of the soil. In this survey area, soils forming on north aspects are more prone to have mollic epipedons.

Vegetation provides shade and surface duff or litter which reduces runoff and erosion. Leaf litter, or duff, also insulates the soil against heat and cold and reduces the rate of evaporation, which increases the length of

time favorable for bacterial activity. Roots loosen the soil material and add organic matter. Sparse vegetative growth does not contribute an appreciable amount of organic matter. Soils that developed under chamise vegetation are low in organic matter and often have a light-colored surface layer with sparse litter deposits; this is a characteristic of the Trigo soils. Soils that developed under dense, mixed chaparral types normally have a higher organic matter content and a darker colored surface layer. Duff or litter layers may be several inches thick. This is a characteristic of the San Andreas family.

Time

Generally, the age of a soil is related to the degree of profile development and differentiation of horizons within the soil. A soil that has little or no horizonation in its profile is considered young. Much of the survey area is occupied by Entisols such as the Trigo and Pacifico families. A soil that is strongly developed is considered old or mature. Such soils might contain a clay-enriched subsoil horizon or a silica cemented layer directly below; this is characteristic of the Hodgson family.

The maturity of any soil depends on the interaction of the soil-forming factors. A long period of time is generally required for soil formation. Factors that favor rapid soil profile development are: a humid, tropical climate; lush vegetation; unconsolidated, permeable parent material rich in weatherable minerals; and nearly level to gently sloping topography. Factors that contribute to a slow rate of development are: an arid, cold climate; little or no vegetation; dense, hard, siliceous rock; and very steep slopes.

Relief

Relief influences soil formation primarily by its effect upon drainage, runoff, and water erosion, and secondarily by variations in exposure to sun and wind and air in drainages.

Relief is a very important factor in soil formation on steep slopes. Soils on very steep slopes, especially if not densely covered with vegetation, tend to have more erosion than soils on more gentle slopes. In very steep areas of the forest, the soil material may be removed by erosion as fast as it forms.

Very steep soils generally have rapid runoff and are shallow. The characteristics of Trigo family soils have been determined in part by their steep slopes. Associated with these shallow residual soils are deep colluvial soils, particularly on north-facing slopes. These colluvial soils are noncohesive and unstable and contain a high percentage of coarse fragments in the soil profile. Once the protective vegetation on these soils is removed, only minor disturbance is needed to cause the soils to move downslope.

Because of the east-west orientation of the San Bernardino Mountains, north- and south-facing slopes have a pronounced influence on soil development and vegetation composition. Aspect and slope of the soil affect the soil temperature. Lizzant soils are generally on north-facing slopes, which are cooler and support more dense vegetation. More vegetation generally results in darker colors in the surface soil. On broad ridgetops at gentler slopes and higher elevations, soils are generally deeper. This is characteristic of the Wind River soils.

Soil Properties

The results of physical and chemical analyses are given in table 4. The data are for soils sampled at carefully selected sites. The pedons are typical of the families and are described in the section "Taxonomic Unit Descriptions". Soil samples were analyzed by the U.S. Department of Agriculture, Soil Conservation Service, National Soil Laboratory, Lincoln, Nebraska. Most determinations, except for grain-size analysis, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an ovendry basis.

TABLE 4. - PHYSICAL AND CHEMICAL ANALYSES OF SELECTED SOI

Soil Family and Sample No.	Horizon	Depth in Inches	2 mm Partical Size % Clay	% Silt	% Sand	Total Organic C Pct of 2 mm	N	NH4OAc Extractable Bases meq/100 grams Ca	Mg	Na	K	Sum
Brader												
792405	A1	0-3	5.6	17.3	77.1	3.90	0.090	5.9	0.6	-	0.5	7.0
792406	B2	3-16	4.9	21.1	74.0	1.15	0.040	4.1	0.5	-	0.4	5.0
792407	C1	16-19	4.9	17.9	77.2	0.31	2.900		0.5	-	0.4	3.9
Hecker												
792399	A1	0-6	9.2	29.3	61.5	1.82	0.105	8.8	1.7	(2)	0.7	11.2
792400	B1t	6-20	9.8	30.4	59.8	0.48	0.030	4/4	1/1	-	0.4	5.9
792401	B2t	20-37	13.8	29.8	56.4	0.21		6.4	1.9	-	0.4	8.7
792402	B3	37-50	12.2	27.3	60.5	0.14		6.8	2.3	-	0.3	9.4
Modesto												
792416	A1	0-5	11.7	28.6	59.7	1.63	0.106	9.9	1.7	-	0.5	12.1
792417	b11	5-8	15.7	30.0	54.3	0.78	0.061	8.4	1.8	-	0.3	10.5
792418	B12	8-15	16.4	33.3	50.3	0.46	0.041	9.1	2.2	-	0.2	11.5
792419	B2t	15-28	19.0	30.3	50.7	0.24		12.8	4.2	0.4	0.1	17.5
792420	B3	28-50	15.6	26.6	57.8	0.15		12.1	4.9	0.2	0.1	17.3
Osito												
792397	A1	0-5	7.4	19.8	72.8	0.64	0.049	6.1	1.1	-	0.2	7.4
792398	B2	5-13	10.2	15.5	74.3	0.18	0.017	10.5	1.9	(2)	0.1	12.5
Preston												
792423	A1	0-4	3.4	14.8	81.8	3.30	0.104	7.9	0.5	-	0.4	8.8
792424	C1	4-19	2.0	15.9	82.1	0.70	0.025	3.1	0.2	-	0.3	3.6
792425	C2	19-28	3.2	15.2	81.6	0.32		2.4	0.3	-	0.3	3.0
Wind River												
792412	A1	0-5	6.3	19.6	74.1	2.20	0.090	3.8	0.8	-	0.6	5.2
792413	A3	5-19	8.6	18.8	72.6	0.72	0.043	3.8	0.4	-	0.4	4.6
792414	B2	19-34	8.1	31.1	60.8	0.39	0.026	3.8	0.3	-	0.3	4.4
792415	C1	34-45	9.3	20.8	69.9	0.23		3.6	0.5	(2)	0.2	4.3

1- Soils analyzed by the National Soil Survey Laboratory, Soil Conservation Service, Lincoln, Nebraska.
2- Trace

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Glossary

Alluvial fan. A fan-shaped deposit of sand, gravel, and fine material dropped by a stream where it flows out onto a level plain or meets a slower stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Aspect. The direction a slope is facing; its exposure in relation to the sun.

Association, soil. (i) A group of defined and named taxonomic soil units occurring together in an individual and characteristic pattern over a geographic region, comparable to plant associations in many ways. (Sometimes called natural land type.) (ii) A map unit used on general soil maps, in which two or more defined taxonomic units occurring together in a characteristic pattern are combined because the scale or purpose of the map does not require delineation of the individual soils.

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides and ridge sides. Back slopes in profile are commonly steep and linear and may or may not include cliff segments.

Badland. Steep or very steep, commonly nonstony barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Base saturation. The degree to which material having base-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock underlying the soil and other unconsolidated material at depths ranging from 0 (where exposed at the surface by erosion) to several hundred feet.

Calcareous soil. A soil containing enough calcium carbonate, commonly occurring with magnesium carbonate, to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chaparral. Evergreen shrubs that have woody stems and hard leathery leaves, are drought resistant, and are generally less than 15 feet (3m) tall and evergreen, or deciduous soft shrubs (shrub forms with little woody tissue) mostly less than 5 feet tall (1.5 m).

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Clay loam. Soil material that contains 27 to 40 percent clay particles and 20 to 45 percent sand particles.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Color. See Munsell color notation.

Complex, soil. A map unit used in detailed soil surveys where two or more defined taxonomic units are so intricately intermixed on the landscape that it is impractical, because of the scale used in mapping, to separate them. A more intimate mixing of smaller areas of individual taxonomic units than that described under Association, soil.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:
Loose - Noncoherent when dry or moist; does not hold together in a mass.
Friable - When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm - When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic - When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky - When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard - When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft - When dry, breaks into powder or individual grains under very slight pressure.

Cemented. Hard; little affected by moistening.

Depth class. The distance from the surface of the soil to underlying bedrock, consolidated substratum, or other material that would greatly restrict either root distribution or soil moisture and nutrient supply.

Depth, effective rooting. The depth of soil material which plant roots can penetrate readily to obtain water and plant nutrients.

Dry ravel. Unconsolidated material consisting of rock fragments, finer grained earth material, and organic matter deposited on and at the base of steep slopes by direct gravitational action.

Effervescence. The fizz observed when dilute hydrochloric acid is applied to a soil containing free carbonates. The amount of effervescence is divided into four classes: very slightly effervescent, slightly effervescent, strongly effervescent, and violently effervescent.

Erosion. (i) The wearing away of the land surface by running water, wind, ice, or other geologic agents, including such processes as gravitational creep. (ii) Detachment and movement of soil or rock by water, wind, ice, or gravity. The following terms are used to describe different types of water erosion:

Accelerated erosion. Erosion much more rapid than normal, natural, or geologic erosion, primarily as a result of the activities of man or, in some cases, of animals.

Geologic erosion. The normal or natural erosion caused by geologic processes acting over long geologic periods. Synonymous with natural erosion.
Gully erosion. The erosion process whereby water accumulates in narrow channels and, over short periods, removes the soil from this narrow area to considerable depths, ranging from 0.5 meter to as much as 25 to 30 meters. See Gully.
Natural erosion. Wearing away of the earth's surface by water, ice, or other natural agents under natural environmental conditions of climate, vegetation, etc., undisturbed by man. See Geologic erosion.
Normal erosion. The gradual erosion of land used by man which does not greatly exceed natural erosion. See Natural erosion.
Rill erosion. An erosion process in which numerous small but well-defined channels only several centimeters deep are formed. See Rill.
Sheet erosion. The removal of a fairly uniform layer of soil from the land surface by rainfall and surface runoff, without the development of distinct water channels.
Splash erosion. The detachment and airborne movement of small soil particles caused by the impact of raindrops on soils.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and produced by erosion or faulting. Synonym: scarp.

Fertility, soil. The quality of a soil that enables it to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has been allowed to drain away; the field moisture content 2 or 3 days after a soaking rain; also called normal field capacity, normal moisture capacity, or capillary capacity.

Flood Plain. The land bordering a stream, built up of sediments from overflow of the stream and subject to inundation when the stream is at flood stage.

Foot slope. The inclined surface at the base of a hill.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Forest. Generally, an area of land covered by trees whose crowns are mostly touching. Because closed

forests with interlacing crowns are rare in southern California, areas where the trees furnish a crown cover of 60 percent or more are considered forests.

Glacial drift. All rock material transported and deposited by glacial ice and meltwater.

Gneiss. A coarse-grained rock in which bands rich in granular minerals alternate with bands in which schistose minerals predominate. See Schist.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. A single piece is a pebble.

Granite. A plutonic rock consisting essentially of alkalic feldspar and quartz. Sodic plagioclase, usually oligoclase, is commonly present in small amounts and muscovite, biotite, hornblende, or rarely pyroxene may be mafic constituents. Loosely used for any light-colored, coarse-grained igneous rock.

Granitic. Of, pertaining to, or composed of granite or granitelike rock. See Granite.

Granodiorite. A plutonic rock consisting of quartz, calcic oligoclase or andesine, and orthoclase, with biotite, hornblende, or pyroxene as mafic constituents. Granodiorite is intermediate between quartz monzonite and quartz diorite and contains at least twice as much plagioclase as orthoclase.

Gully. A very small valley with steep sides cut by running water and through which water ordinarily runs only after rainfall or snowmelt. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to wheeled vehicles and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hill. A natural elevation of the land surface, rising as much as 1,000 ft (300 m) above surrounding lowlands, usually of restricted summit area and having a well-defined outline; hill slopes generally exceed 15 percent. The distinction between a hill and a mountain is often dependent on local usage.

Hillslope. The steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at its base. In descending order geomorphic components of a simple hill slope may include shoulder, back slope, foot slope and toe slope. However, not all of these components are necessarily present in any given hill slope continuum. Complex hill slopes may include two or more back slope to toe slope sequences.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon. An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon. The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon. The mineral horizon below an A Horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon. The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer. Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or B horizon.

Igneous rock. Rock that formed from the cooling and solidification of magma, and that has not been changed appreciably since its formation.

Impervious. Resistant to penetration by fluids or by roots.

Inclusions. Soils occurring in the map unit that are not identified by their names because the area they occupy is too small.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasting with percolation, which is movement of water through soil layers or material.

Landslide. (i) A mass of material which has slipped down hill under the influence of gravity, frequently assisted by water (that is, when the material is saturated). (ii) Rapid movement downslope of a mass of soil, rock, or debris.

Leaching. The removal of materials in solution from the soil.

Limestone. A bedded sedimentary deposit consisting chiefly of calcium carbonate ($CaCO_3$), which yields lime when burned. Limestone is the most important and widely distributed of the carbonate rocks and is the consolidated equivalent of limy mud, calcareous sand, or shell fragments.

Lithic contact. A boundary between soil and continuous, coherent underlying material. The underlying material must be sufficiently coherent to make hand-digging with a spade impractical. If mineral, it must have a hardness of 3 or more (Mohs' scale), and gravel-sized chunks that can be broken out do not disperse within 15 hours of shaking in water or in sodium hexametaphosphate solution.

Loam. Soil material that contains 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy sand. Soil material that contains at the upper limit 85 to 90 percent sand particles, and the percentage of silt particles plus 1.5 times the percentage of clay particles is not less than 15; at the lower limit it contains not less than 70 to 85 percent sand particles, and the percentage of silt particles plus twice the percentage of clay particles does not exceed 30. Subclasses include:

Loamy coarse sand. 25 percent or more very coarse and coarse sand particles and less than 50 percent any other grade of sand particles.

Loamy sand. 25 percent or more very coarse, coarse, and medium sand particles and less than 50 percent fine or very fine sand particles.

Loamy fine sand. 50 percent or more fine sand (or) less than 25 percent very coarse, coarse, and medium sand particles and less than 50 percent very fine sand particles.

Metamorphic rock. Rock derived from pre-existing rocks but that differs from them in physical, chemical, and mineralogical properties as a result of natural geological processes, principally heat and pressure, originating within the earth. The pre-existing rocks may have been igneous, sedimentary, or another form of metamorphic rock.

Microclimate. (i) The climatic condition of a small area resulting from the modification of the general climatic conditions by local differences in elevation or exposure. (ii) The sequence of atmospheric changes within a very small region.

Microrelief. Small-scale, local differences in topography, including mounds, swales, or pits that are only a few feet in diameter and with elevational differences of up to 6 feet.

Miscellaneous land type. A mapping designation for land areas that have little or no natural soil, that are too nearly inaccessible for orderly examination, or that for any reason are not amenable to soil classification (examples: Riverwash, Rock outcrop, Badland).

Mollic epipedon. A thick, dark colored, organic-rich surface horizon, high in nutrients, with good structure. It is not both massive and hard or very hard when dry. It should be moist in at least some part for 3 months or more (cumulative) of the year in more than 7 out of 10 years. It has Munsell color value darker than 3.5 when moist and 5.5 when dry, and chroma less than 3.5 when moist. The organic-carbon content is at least 0.6 percent (1 percent organic matter). The thickness must be at least 7 inches thick or 1/3 the thickness of the solum, or at least 4 inches if directly underlain by a paralithic or lithic contact.

Mountain. A natural elevation of the land surface, rising more than 1,000 ft (300 m) above surrounding lowlands, commonly of restricted summit area and generally having steep sides (25 percent slope) and considerable bare-rock surface. A mountain can be a single, isolated mass or part of a group forming a chain or range. Mountains are formed primarily by deep-seated earth movements or volcanic action or both and secondarily by differential erosion.

Munsell color notation. A color designation system that specifies the relative degrees of the three simple variables of color: hue, value, and chroma. For example, 10YR 6/4 is a color (of soil) with hue of 10YR, value of 6, and chroma of 4. These notations can be translated into several different systems of color names as desired.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Organic matter, soil. The organic fraction of the soil. Includes plant, animal, and microbial residues, fresh and at all stages of decomposition, and the relatively resistant soil humus.

Paralithic contact. Similar to a lithic contact except that the mineral material below the contact has a hardness of less than 3 (Mohs' scale), and gravel-size chunks that can be broken out will partially

disperse within 15 hours of shaking in water or sodium hexametaphosphate solution.

Parent material. The unconsolidated and more or less chemically weathered mineral or organic matter from which the solum of soils is developed by pedogenic processes.

Pebble. A fragment of rock up to 3 inches in diameter. An individual piece of gravel.

Ped. A unit of soil structure such as an aggregate, crumb, prism, block, or granule, formed by natural processes (in contrast with a clod, which is formed artificially).

Pedon. A three-dimensional body of soil with lateral dimensions large enough to permit the study of horizon shapes and relations. Its area ranges from 1 to 10 square meters, depending on the variability of the soil. Where horizons are intermittent or cyclic and recur at linear intervals of 2 to 7 meters, the pedon includes one-half of the cycle. Where the cycle is less than 2 meters or all horizons are continuous and of uniform thickness, the pedon has an area of approximately 1 square meter. If the horizons are cyclic but recur at intervals greater than 7 meters, the pedon reverts to the 1 square meter size, and more than one soil will usually be represented in each cycle.

Percolation. The downward movement of water through soil; especially, the downward flow of water in saturated or nearly saturated soil at hydraulic gradients of the order of 1.0 or less.

Permanent wilting percentage. The water content of a soil when indicator plants growing in that soil wilt and fail to recover when placed in a humid chamber. Often estimated by 15-bar percentage.

pH, soil. The negative logarithm of the hydrogen-ion activity of a soil. The degree of acidity (or alkalinity) of a soil as determined by means of a glass, quinhydrone, or other suitable electrode or indicator at a specified moisture content or soil-water ratio, and expressed in terms of the pH scale.

pH value. A numerical designation of acidity and alkalinity in the soil. See Reaction, soil.

Phase, soil. A subdivision of a soil type or other unit of classification having characteristics that affect the use and management of the soil but that do not vary sufficiently to differentiate the soil as a separate type. The phases of families and subgroups used in this survey are based on differences in slope, climate, depth, or content of lime.

Slope phase

2 to 15 percent
15 to 30 percent
30 to 50 percent
50 to 75 percent

50 to 100 percent or a combination of two of the above; examples are 2 to 30 percent and 15 to 50 percent.

Dry phase. Soils of a dry phase have significantly lower soil moisture that affects the type of vegetation they can support. The lower soil moisture is usually due to less annual precipitation but can also be a result of differences in aspect or elevation.

Calcareous phase. Soils of a calcareous phase formed in material weathered from limestone and contain sufficient free calcium carbonate ($CaCO_3$) to effervesce visibly when treated with cold 0.1N hydrochloric acid.

Cool phase. Soils of a cool phase are at higher elevations, generally above 7,000 feet, and have a mean annual soil temperature lower than 47 degrees F.

Warm phase. Soils of a warm phase are at lower elevations, generally below 4,500 feet, and have a mean annual soil temperature higher than 59 degrees F.

Very deep phase. This phase includes alluvial soils that are over 60 inches deep. Shallower soils that formed over bedrock are classified as:

Shallow - less than 20 inches to bedrock.
Moderately deep - 20 to 40 inches to bedrock.
Deep - 40 to 60 inches to bedrock.

Physical properties of soils. Those characteristics, processes, or reactions of a soil that are caused by physical forces and that can be described by, or expressed in, physical terms or equations. Sometimes confused with and difficult to separate from chemical properties, whence, the terms physical-chemical or physicochemical. Examples of physical properties are bulk density, water-holding capacity, hydraulic conductivity, porosity, pore-size distribution, etc.

Plutonic. Pertaining primarily to igneous rocks formed deep in the earth's crust, but also including associated metamorphic rocks.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity are expressed thus:

pH	
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual material). Unconsolidated, highly weathered, or partly weathered mineral material that accumulated by disintegration of consolidated rock in place.

Ridge. A long, narrow elevation of the land surface, usually sharp crested with steep sides and forming an extended upland between valleys. The term is used in areas of both hill and mountain relief.

Rill. A small, intermittent water course with steep sides; usually only a few inches deep and hence no obstacle to machinery operations.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; in order of increasing size, pebbles, cobbles, stones, and boulders.

Runoff. That portion of the precipitation on an area which is discharged into stream channels. Water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground water runoff or seepage flow from ground water. (In soil science "runoff" usually refers to the water lost by surface flow; in geology and hydraulics "runoff" usually includes both surface and subsurface flow.)

Sand. (i) As a soil separate (component), individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. (ii) As a soil textural class, soil material that contains 85 percent or more of sand; the percentage of silt particles plus 1.5 times the percentage of clay particles shall not exceed 15. Subclasses include:

Coarse sand. 25 percent or more very coarse and coarse sand particles, and less than 50 percent any other one grade of sand particles.

Sand. 25 percent or more very coarse, coarse, and medium sand particles and less than 50 percent fine or very fine sand particles.

Sandstone. A cemented or otherwise compacted detrital sediment composed predominantly of sand-sized quartz grains. Mineralogical varieties such as feldspathic and glauconitic sandstones are recognized, and also argillaceous, siliceous, calcareous, ferruginous, and other varieties according to the nature of the binding or cementing material.

Sandy loam. Soil material that contains 20 percent or less clay particles and 52 percent or more sand particles, and the percentage of silt particles plus twice the percentage of clay particles exceeds 30; or that contains less than 7 percent clay particles, less than 50 percent silt particles, and between 43 percent and 52 percent sand particles. Subclasses are:

Coarse sandy loam. 25 percent or more very coarse and coarse sand particles and less than 50 percent or more sand particles.

Sandy loam. 30 percent or more very coarse, coarse, and medium sand particles, but less than 25 percent very coarse sand particles and less than 30 percent very fine or fine sand particles.

Fine sandy loam. 30 percent or more fine sand particles and less than 30 percent very fine sand particles (or) between 15 and 30 percent very coarse, coarse, and medium sand particles.

Very fine sandy loam. 30 percent or more very fine (or) more than 40 percent fine and very fine sand particles at least half of which is very fine sand particles and less than 15 percent very coarse, coarse, and medium sand particles.

Sandy clay loam. Soil material that contains 20 to 35 percent clay particles, less than 28 percent silt particles, and 45 percent or more sand particles.

Schist. A medium- or coarse-grained metamorphic rock with subparallel orientation of the micaceous minerals which dominate its composition.

Sediment. Material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, or ice and has come to rest on the earth's surface.

Sedimentary rock. A rock largely composed of particles deposited from suspension in water. The chief sedimentary rocks are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sands have been consolidated into sandstone.

Shrub. A short, low-branching woody perennial, commonly having several main stems arising from a central point in the root system.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Site. (i) In ecology, an area described or defined by its biotic, climatic, and soil conditions as related to its capacity to produce vegetation. (ii) An area sufficiently uniform in biotic, climatic, and soil conditions to produce a particular climax vegetation.

Site index. (i) A quantitative evaluation of the productivity of a soil for forest growth under the existing or specified environment. (ii) The height in feet of the dominant forest vegetation taken at or calculated to an index age, usually 50 or 100 years.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Soil. The unconsolidated mineral material on the immediate surface of the earth that serves as a natural medium for the growth of land plants. This material has been subjected to and influenced by genetic and environmental factors: parent material, climate (including moisture and temperature effects), macro- and micro-organisms, and topography, all acting over a period of time to make a product soil that differs from the material from which it is derived in many physical, chemical, biological, and morphological properties and characteristics.

Soil genesis. The mode of origin of the soil with special reference to the processes or soil-forming factors responsible for the development of the solum, or true soil, from the unconsolidated parent material.

Soil morphology. (i) The physical constitution, particularly the structural properties, of a soil profile as exhibited by the kinds, thickness, and arrangement of the horizons in the profile and by the texture, structure, consistency, and porosity of each horizon. (ii) The structural characteristics of the soil or any of its parts.

Soil pores. That part of the bulk volume of soil not occupied by soil particles; the interstices or voids.

Soil separates. Mineral particles, less than 2.0 mm in equivalent diameter, ranging between specified size limits. The names and size limits of separates recognized in the United States are: very coarse sand, 2.0 to 1.0 mm; coarse sand, 1.0 to 0.5 mm; medium sand, 0.5 to 0.25 mm; fine sand, 0.25 to 0.10 mm; very fine sand, 0.10 to 0.05 mm; silt, 0.05 to 0.002 mm; and clay, less than 0.002 mm.

Soil structure. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are: platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Soil survey. The systematic examination, description, classification, and mapping of soils in an area. Soil surveys are classified according to the kind and intensity of field examination.

Soil temperature regimes are based on mean soil temperature and difference between mean summer and mean winter temperature. Soil temperature is determined at a depth of 20 inches (50 cm) or at a lithic or paralithic contact, whichever is shallower. Unless indicated in higher classification categories, soil temperature classes are used at the family level.

Soil temperature classes:

Temperature range (degrees)		
Thermic	59 to 72	
Mesic	47 to 59	
Frigid	32 to 47	difference between mean winter and mean summer is more than 9 degrees F.

Soil texture. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, silty clay. and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse", "fine", or "very fine". (See Soil separates.)

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil

formation are active. The solum in mature soils includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stones. Rock fragments more than 10 inches in diameter if rounded, and longer than 15 inches along the longer axis if flat. (See Rock fragments.)

Stony. (i) Containing sufficient stones to interfere with or to prevent tillage. For a soil to be classified as stony, more than 0.01 percent of the surface of the soil must be covered with stones. (ii) Used to modify soil class, as stony clay loam or clay loam, stony phase.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Talus. Rock fragments of any size or shape (usually coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted with flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Toe slope. The outermost, gently inclined surface at the base of a hill slope. Toe slopes in profile are commonly gentle and linear and in terms of gradational processes, they are constructional surfaces forming the distal part of a hill slope continuum that grades to valley or closed-depression floors.

Topography. The relative positions and elevations of the natural or manmade features of an area that describe the configuration of its surface.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongate, relatively large, externally drained depression of the earth's surface that is primarily developed by stream erosion.

Valley floor. A general term for the nearly level to gently sloping bottom surface of a valley. Component landforms include axial stream channels, the flood plains, and in some areas, low terrace surfaces that may be subject to flooding from tributary streams.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents with essentially no transport of the altered material. These changes result in disintegration and decomposition of the material.

Woodland. An area of land covered by trees of a characteristic form whose crowns are generally not touching.

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Office of the Assistant Secretary for Civil Rights
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Washington, D.C. 20250-9410;

(2) fax: (202) 690-7442; or

(3) email: program.intake@usda.gov.

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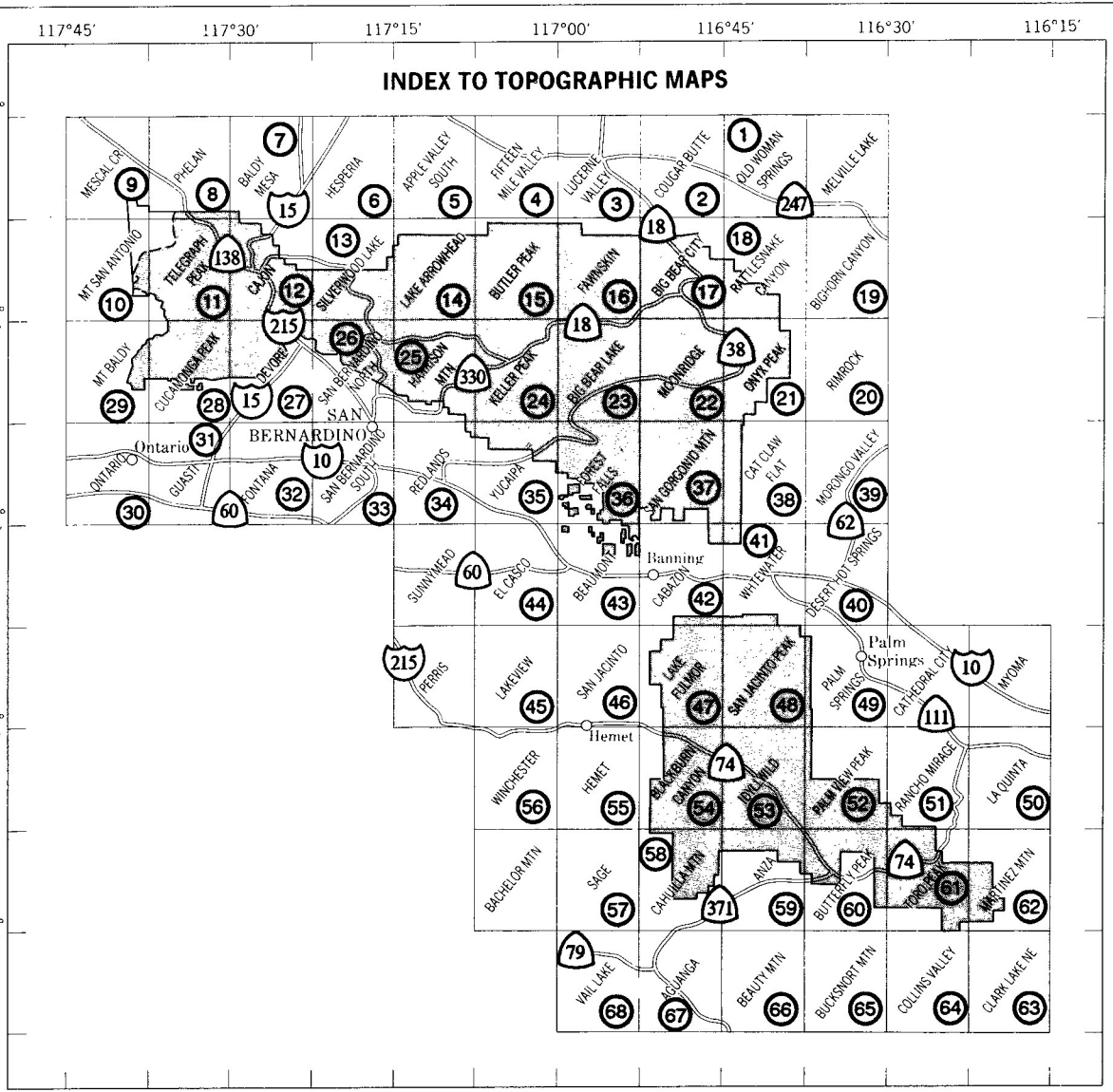
INDEX TO TOPOGRAPHIC MAPS
117°45′
117°30′
117°15′
117°00′
116°45′
116°30′
116°15′
34°
34° 15′
34° 00′
33° 45′
33° 30′
MESCAL CR
PHELAN
BALDY MESA
HESPERIA
APPLE VALLEY SOUTH
FIFTEEN MILE VALLEY
LUCERNE VALLEY
COUGAR BUTTE
OLD WOMAN SPRINGS
MELVILLE LAKE
MT SAN ANTONIO
TELEGRAPH PEAK
CAJON
SILVERWOOD LAKE
LAKE ARROWHEAD
BUTLER PEAK
FAWNSKIN
BIG BEAR CITY
RATTLESNAKE CANYON
BIGHORN CANYON
MT BALDY
CUCAMONGA PEAK
DEVORE
SAN BERNARDINO NORTH
HARRISON MTN
KELLER PEAK
BIG BEAR LAKE
MOONRIDGE
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RIMROCK
Ontario
SAN BERNARDINO
ONTARIO
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REDLANDS
YUCAIPA
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SAN GORGONIO MTN
CAT CLAW FLAT
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Banning
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WHITEWATER
DESERT HOT SPRINGS
PERRIS
LAKEVIEW
SAN JACINTO
LAKE FULMOR
SAN JACINTO PEAK
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Palm Springs
CATHEDRAL CITY
MYOMA
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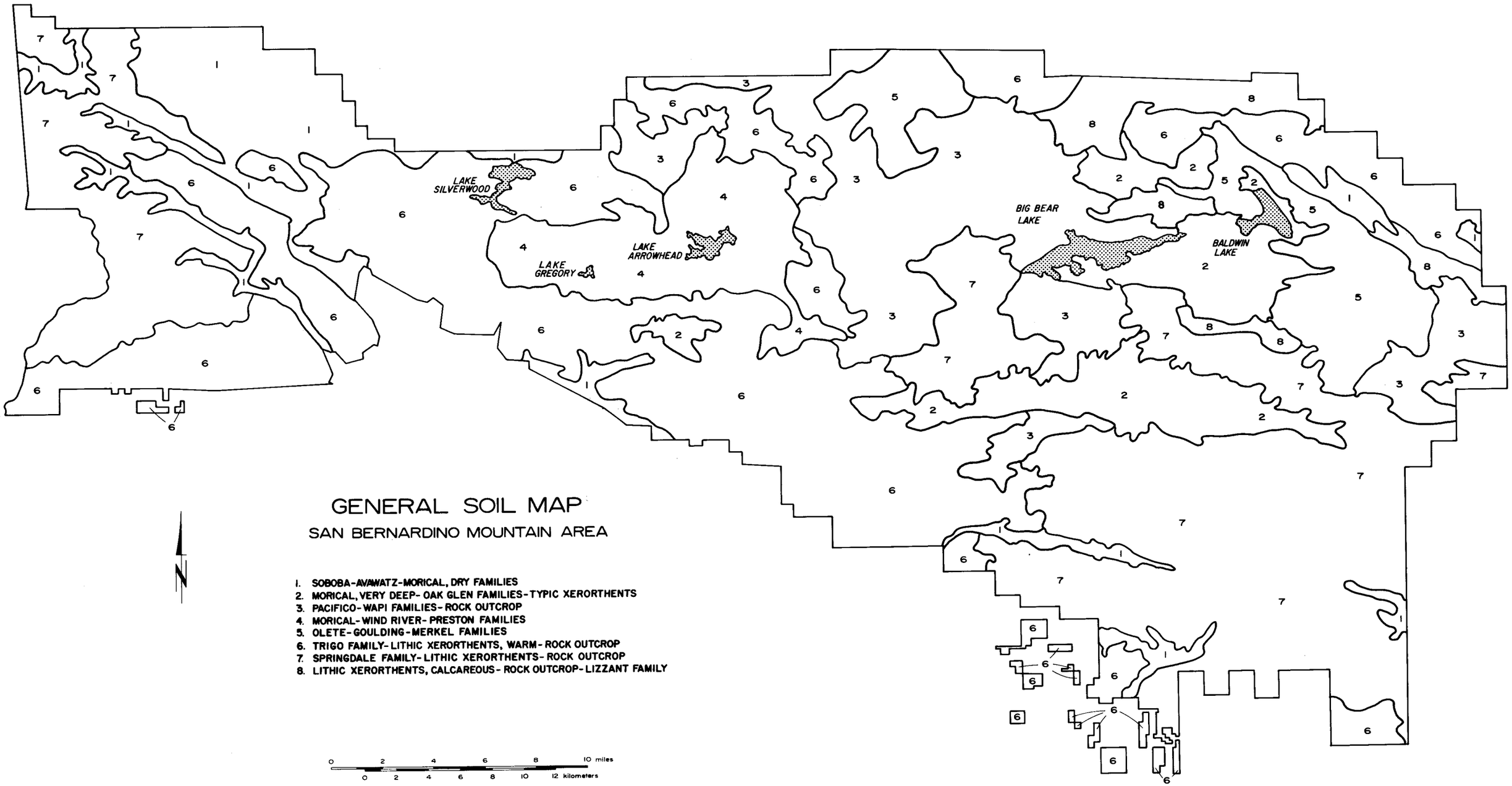
WINCHESTER
HEMET
BLACKBURN CANYON
IDYLLWILD
PALM VIEW PEAK
RANCHO MIRAGE
LA QUINTA
BACHELOR MTN
SAGE
CAHUILLA MTN
ANZA
BUTTERFLY PEAK
TODD PEAK
MARTINEZ MTN
VAIL LAKE
AGUANGA
BEAUTY MTN
BUCKSNORT MTN
COLLINS VALLEY
CLARK LAKE NE



GENERAL SOIL MAP

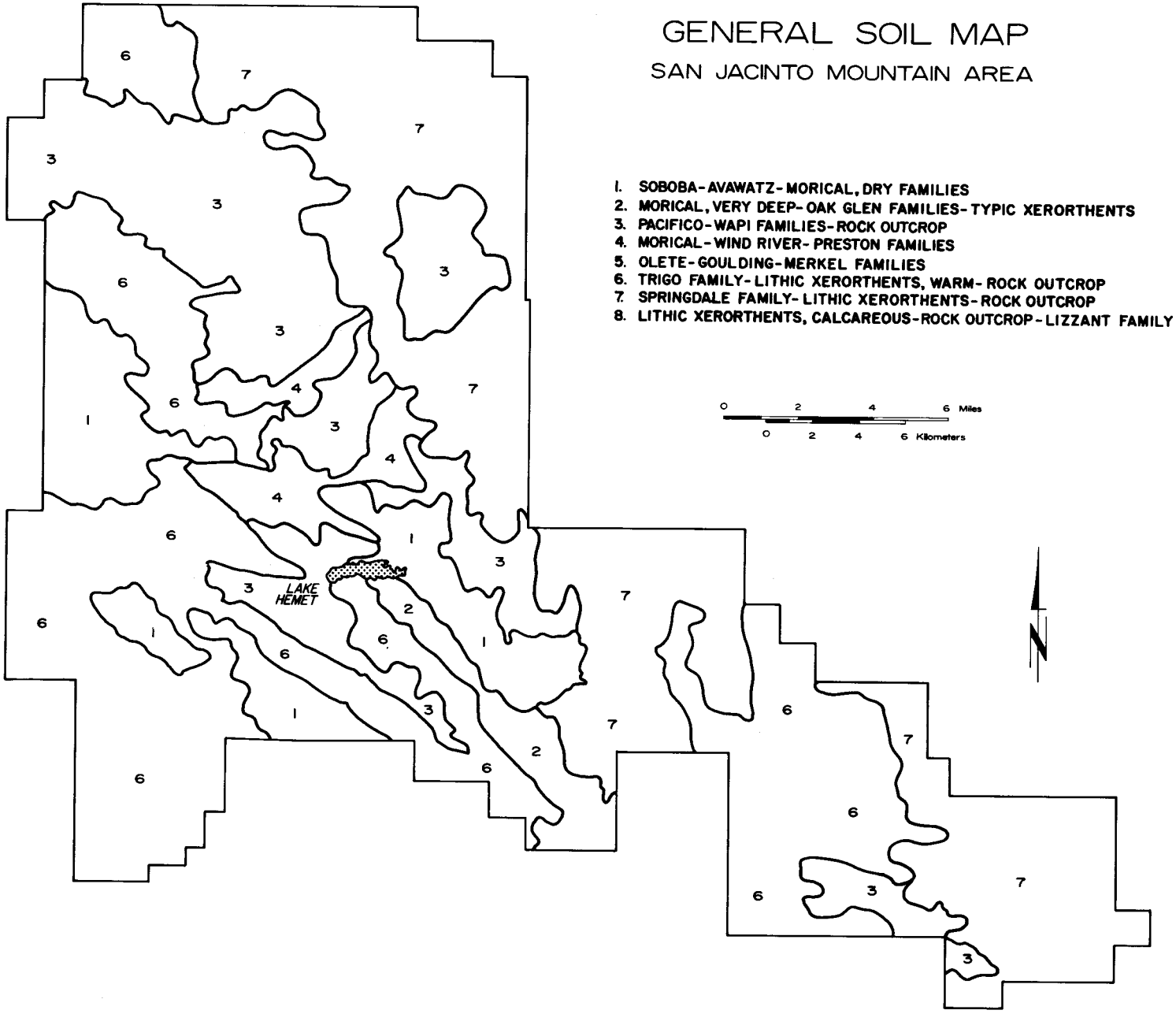
SAN BERNARDINO MOUNTAIN AREA

1. SOBOBA-AVAWATZ-MORICAL, DRY FAMILIES
2. MORICAL, VERY DEEP- OAK GLEN FAMILIES-TYPIC XERORTHENTS
3. PACIFICO-WAPI FAMILIES-ROCK OUTCROP
4. MORICAL-WIND RIVER-PRESTON FAMILIES
5. OLETE-GOULDING-MERKEL FAMILIES
6. TRIGO FAMILY-LITHIC XERORTHENTS, WARM-ROCK OUTCROP
7. SPRINGDALE FAMILY-LITHIC XERORTHENTS-ROCK OUTCROP
8. LITHIC XERORTHENTS, CALCAREOUS-ROCK OUTCROP-LIZZANT FAMILY

0 2 4 6 8 10 miles
0 2 4 6 8 10 12 kilometers

GENERAL SOIL MAP

SAN JACINTO MOUNTAIN AREA



1. SOBOBA-AVAWATZ-MORICAL, DRY FAMILIES
2. MORICAL, VERY DEEP-OAK GLEN FAMILIES-TYPIC XERORTHENTS
3. PACIFICO-WAPI FAMILIES-ROCK OUTCROP
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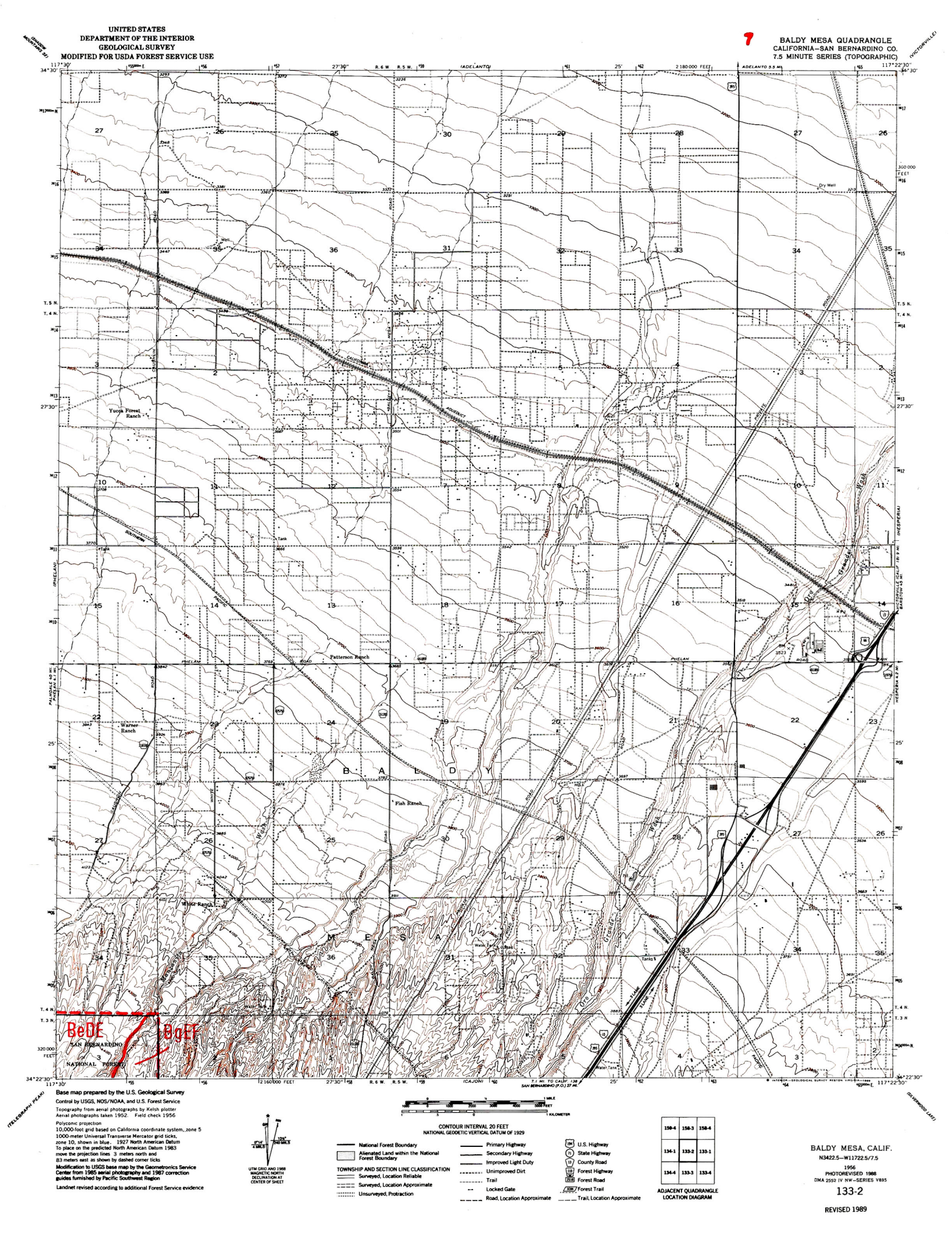
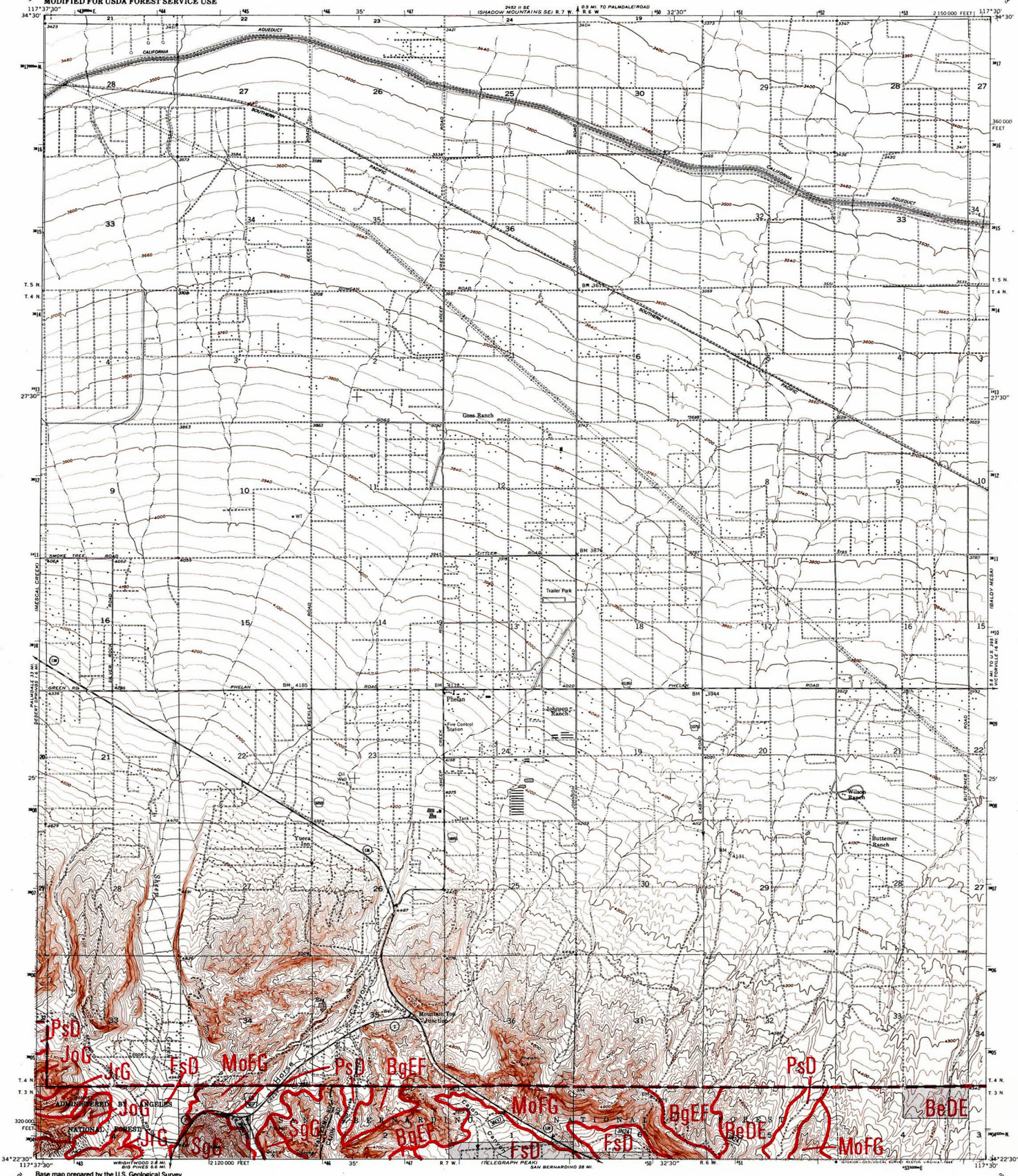
8. LITHIC XERORTHENTS, CALCAREOUS-ROCK OUTCROP-LIZZANT FAMILY


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE
BALDY MESA QUADRANGLE
CALIFORNIA—SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
BeDE
BgEF
Base map prepared by the U.S. Geological Survey
Control by USGS, NOS/NOAA, and U.S. Forest Service
Topography from aerial photographs by Kelsh plotter
Aerial photographs taken 1952. Field check 1956
Polyconic projection
10,000-foot grid based on California coordinate system, zone 5
1000-meter Universal Transverse Mercator grid ticks,
zone 10, shown in blue. 1927 North American Datum
To place on the predicted North American Datum 1983
move the projection lines 3 meters north and
83 meters east as shown by dashed corner ticks
Modification to USGS base map by the Geometronics Service
Center from 1985 aerial photography and 1987 correction
guides furnished by Pacific Southwest Region
Landnet revised according to additional Forest Service evidence
UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
National Forest Boundary
Alienated Land within the National Forest Boundary
TOWNSHIP AND SECTION LINE CLASSIFICATION
Surveyed, Location Reliable
Surveyed, Location Approximate
Unsurveyed, Protraction
Primary Highway
Secondary Highway
Improved Light Duty
Unimproved Dirt
Trail
Locked Gate
Road, Location Approximate
U.S. Highway
State Highway
County Road
Forest Highway
Forest Road
Forest Trail
Trail, Location Approximate
ADJACENT QUADRANGLE LOCATION DIAGRAM
158-4 158-3 158-4
134-1 133-2 133-1
134-4 133-3 133-4
BALDY MESA, CALIF.
N3422.5—W11722.5/7.5
1956
PHOTOREVISED 1988
DMA 2552 IV NW—SERIES V895
133-2
REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

8

PHELAN QUADRANGLE
CALIFORNIA—SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



Base map prepared by the U.S. Geological Survey
Control by USGS and NOS/NOAA

Topography by aerial photographs by Kelsh plotter
Aerial photographs taken 1952. Field checked 1956

Polyconic projection. 1927 North American Datum
10,000-foot grid based on California coordinate system, zone 5
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue
To place on the predicted North American Datum 1983 move the projection lines 3 meters north and 83 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by Pacific Southwest Region
Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

159-3	159-4	158-3
134-2	134-1	133-2
134-3	134-4	133-3

ADJACENT QUADRANGLE LOCATION DIAGRAM

PHELAN, CALIF.
N3422.5—W11730/7.5

1956
PHOTOREVISED 1988
DMA 2452 I NE—SERIES V895

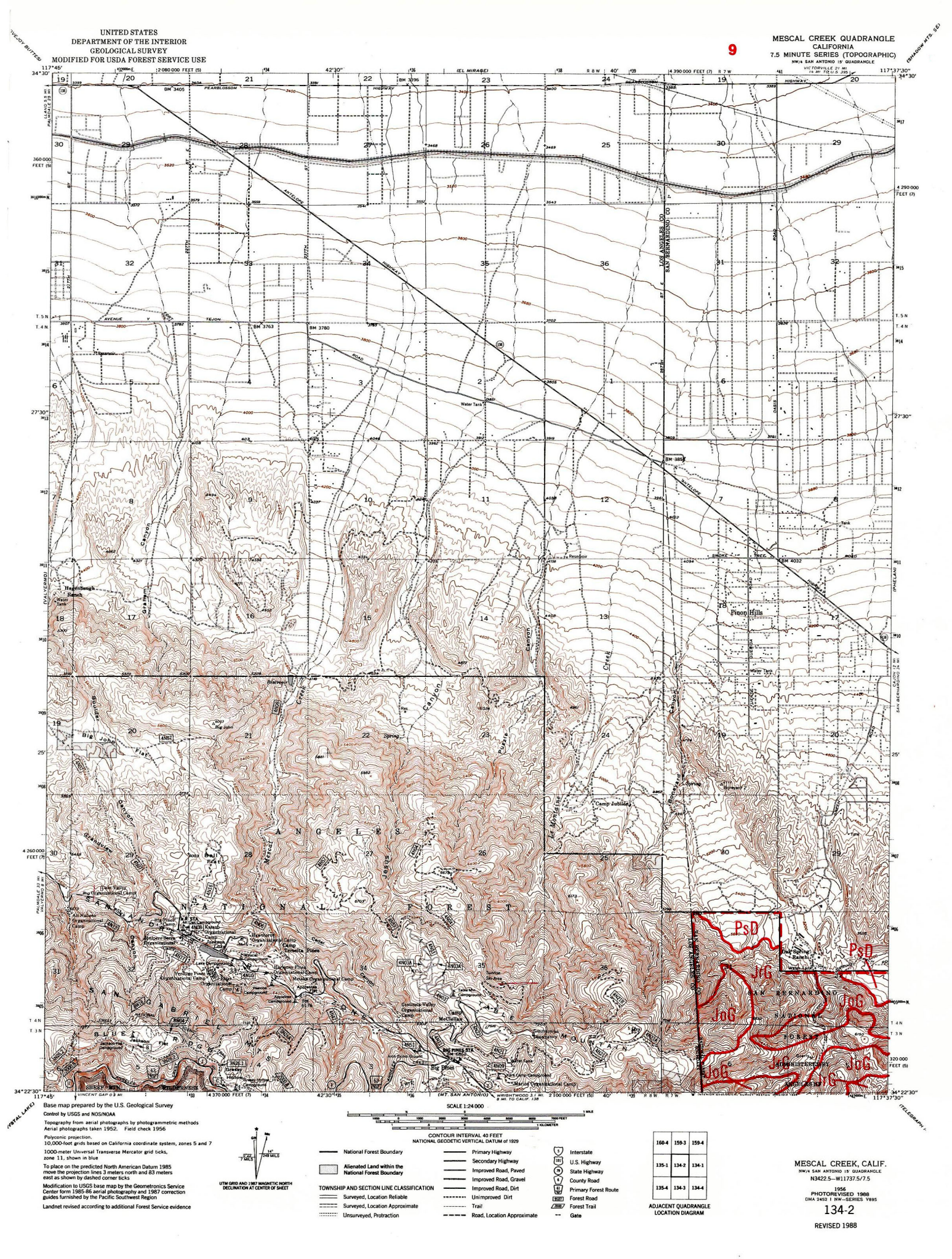
134-1

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

9

MESCAL CREEK QUADRANGLE
CALIFORNIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 SAN ANTONIO 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey

Control by USGS and NOS/NOAA

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1952. Field check 1956

Polyconic projection.
10,000-foot grids based on California coordinate system, zones 5 and 7

1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue

To place on the predicted North American Datum 1985 move the projection lines 3 meters north and 83 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center form 1985-86 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM of 1929

UTM GRID AND 1987 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Road, Paved
- Improved Road, Gravel
- Improved Road, Dirt
- Unimproved Dirt
- Trail
- Road, Location Approximate

- Interstate
- U.S. Highway
- State Highway
- County Road
- Primary Forest Route
- Forest Road
- Forest Trail
- Gate

160-4	159-3	159-4
135-1	134-2	134-1
135-4	134-3	134-4

ADJACENT QUADRANGLE LOCATION DIAGRAM

MESCAL CREEK, CALIF.
NW/4 SAN ANTONIO 15' QUADRANGLE
N3422.5—W11737.5/7.5

1956
PHOTOREVISED 1988
DMA 2452 I NW—SERIES V895

134-2

REVISED 1988

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

10

MOUNT SAN ANTONIO QUADRANGLE
CALIFORNIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

Base map prepared by the U.S. Geological Survey

Control by USGS and NOS/NOAA

Topography from aerial photographs by multiplex methods
Aerial photographs taken 1952. Field check 1955

Polyconic projection. 1927 North American Datum
10,000-foot grids based on California coordinate system, zones 5 and 7
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue

To place on the predicted North American Datum 1983 move the projection lines 3 meters north and 84 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center form 1985-86 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM of 1929

UTM GRID AND 1987 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

- National Forest Boundary
- Allenated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Road, Paved
- Improved Road, Gravel
- Improved Road, Dirt
- Unimproved Dirt
- Trail
- Road, Location Approximate

- Interstate
- U.S. Highway
- State Highway
- County Road
- Primary Forest Route
- Forest Road
- Forest Trail
- Gate

135-1	134-2	134-1
135-4	134-3	134-4
109-1	108-2	108-1

ADJACENT QUADRANGLE LOCATION DIAGRAM

MOUNT SAN ANTONIO, CALIF.
N3415—W11737.5/7.5

1955
PHOTOREVISED 1988
DMA 2452 I SW—SERIES V895

134-3
REVISED 1988

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

11

TELEGRAPH PEAK QUADRANGLE
CALIFORNIA–SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

Base map prepared by the U.S. Geological Survey

Control by USGS and NOS/NOAA

Topography from aerial photographs by multiplex methods
Aerial photographs taken 1952. Field check 1956

Polyconic projection. 1927 North American Datum
10,000-foot grid based on California coordinate system, zone 5
1000-meter Universal Transverse Mercator grid ticks
zone 11, shown in blue

To place on the predicted North American Datum 1983
move the projection lines 3 meters north and
83 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24,000

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

ADJACENT QUADRANGLE LOCATION DIAGRAM

134-2	134-1	133-2
134-3	134-4	133-3
108-2	108-1	107-2

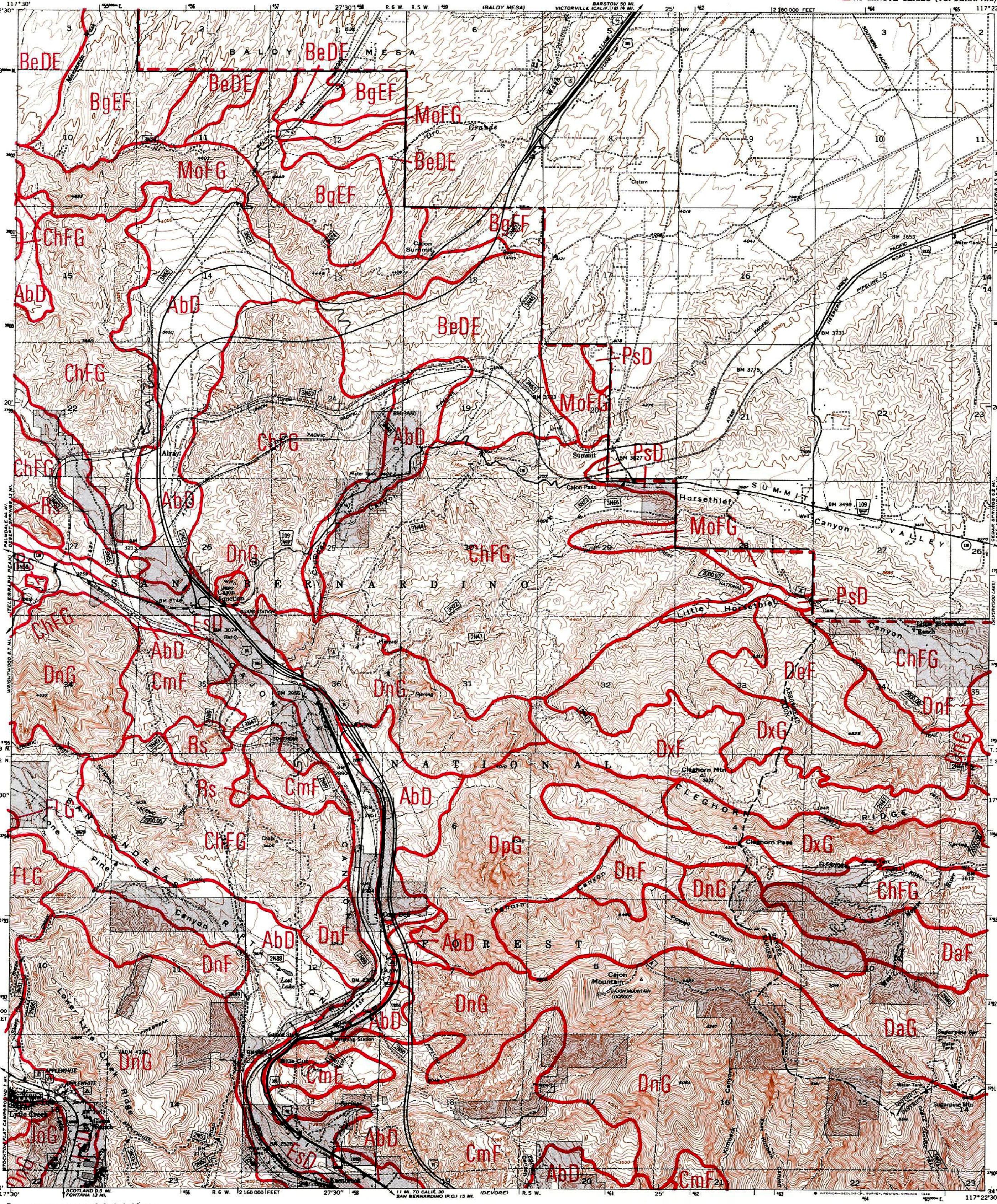
TELEGRAPH PEAK, CALIF.
N3415—W11730/7.5
1956
PHOTOREVISED 1988
DMA 2492 I SE—SERIES V895

134-4

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

12 CAJON QUADRANGLE
CALIFORNIA–SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



Base map prepared by the U.S. Geological Survey
Control by USGS and NOS/NOAA

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1952. Field check 1956

Polyconic projection. 1927 North American Datum
10,000-foot grid based on California coordinate system, zone 5
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue

To place on the predicted North American Datum 1983 move the projection lines 2 meters north and 83 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

0°14' 4 MILS
13½° 240 MILS
UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

1 MILE
5000 FEET
1 KILOMETER

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

National Forest Boundary
Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
Surveyed, Location Reliable
Surveyed, Location Approximate
Unsurveyed, Protraction

Primary Highway
Secondary Highway
Improved Light Duty
Unimproved Dirt
Trail
Locked Gate
Road, Location Approximate

U.S. Highway
State Highway
County Road
Forest Highway
Forest Road
Forest Trail
Trail, Location Approximate

134-1	133-2	133-1
134-4	133-3	133-4
108-1	107-2	107-1

ADJACENT QUADRANGLE LOCATION DIAGRAM

CAJON, CALIF.
N3415—W11722.5/7.5
1956
PHOTOREVISED 1988
DMA 2552 IV SW—SERIES V895

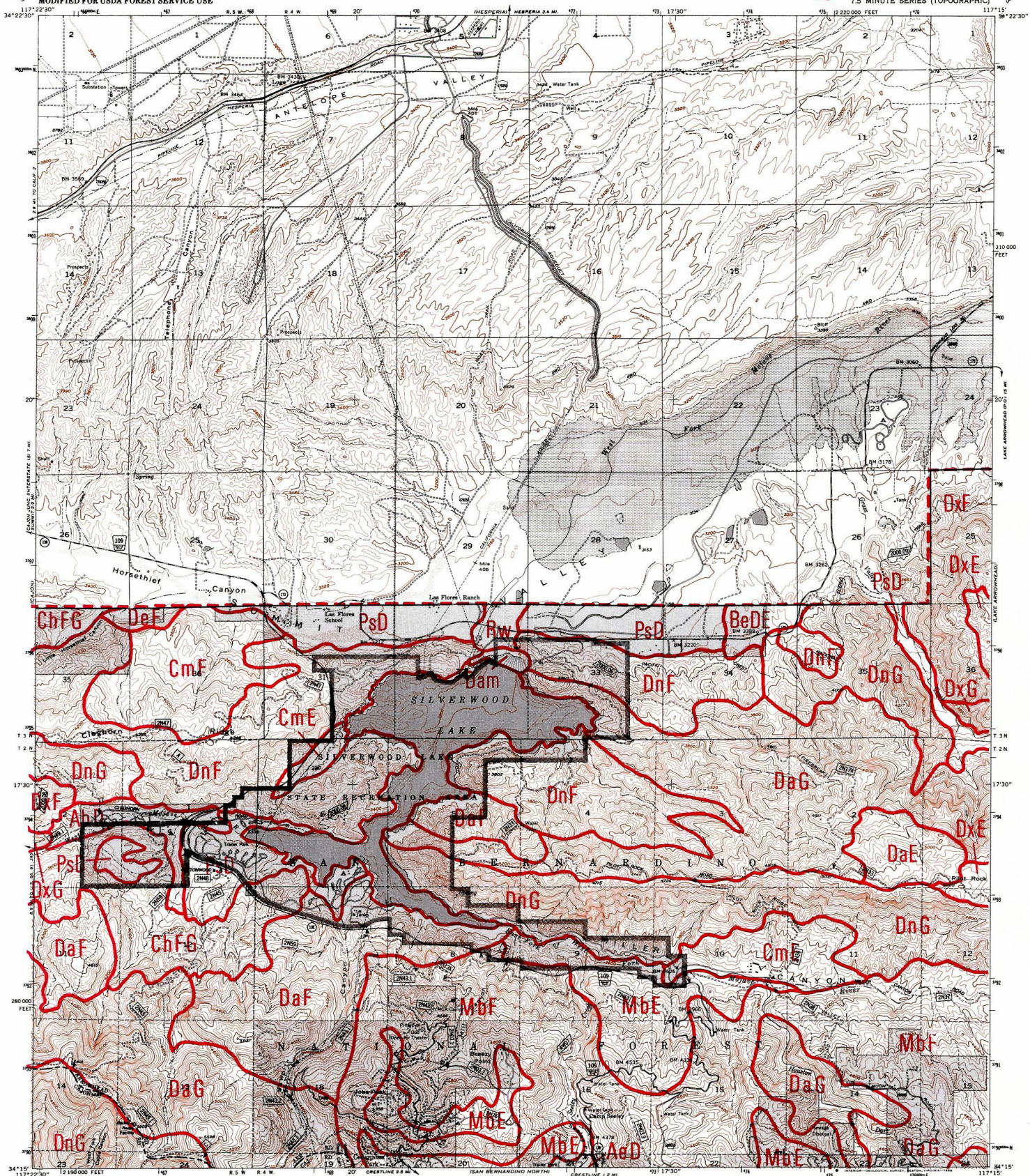
133-3

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

13

SILVERWOOD LAKE QUADRANGLE
CALIFORNIA—SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



117°22'30" 34°22'30" 117°15' 34°15' 17'30" 20' 310 000 FEET 280 000 FEET 2 220 000 FEET 2 190 000 FEET

(BALDY MESA) (APPLE VALLEY) (DEVORE) (HARRISON MTN.)

Base map prepared by the U.S. Geological Survey

Control by USGS and NOS/NOAA

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1952. Field check 1956

Polyconic projection. 1927 North American Datum
10,000-foot grid based on California coordinate system, zone 5
1000-meter Universal Transverse Mercator grid ticks,
zone 11, shown in blue
To place on the predicted North American Datum 1983
move the projection lines 2 meters north and
83 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1984 aerial photography and 1987 correction guides furnished by Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

1 MILE
1 KILOMETER

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

133-2	133-1	132-2
133-3	133-4	132-3
107-2	107-1	106-2

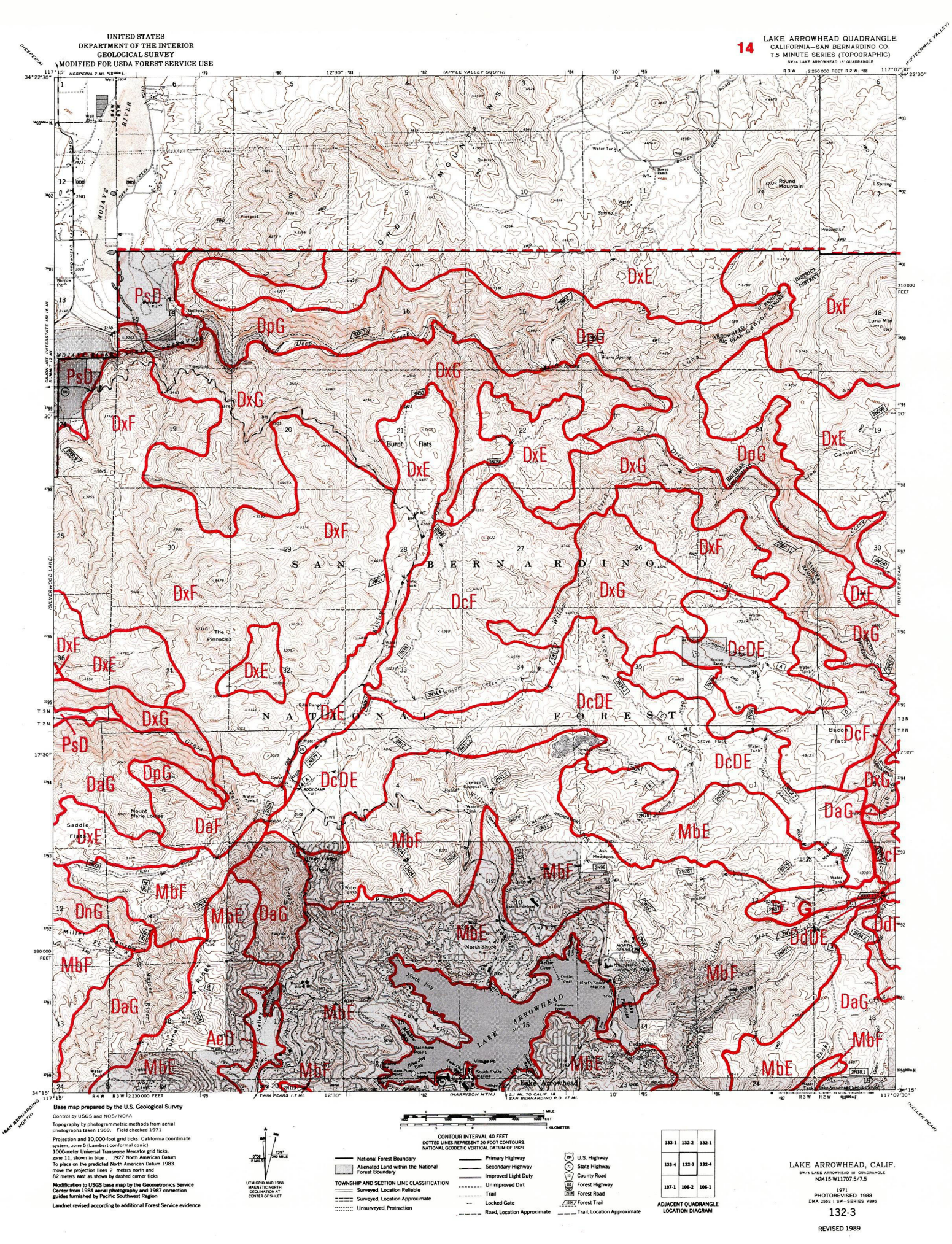
ADJACENT QUADRANGLE LOCATION DIAGRAM

SILVERWOOD LAKE, CALIF.
(FORMERLY CEDAR SPRINGS)
N3415—W11715/7.5

1956
PHOTOREVISED 1988
DMA 2552 IV SE—SERIES V895

133-4

REVISED 1989


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE
14
LAKE ARROWHEAD QUADRANGLE
CALIFORNIA—SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 LAKE ARROWHEAD 15' QUADRANGLE
SAN BERNARDINO NATIONAL FOREST
LAKE ARROWHEAD
Base map prepared by the U.S. Geological Survey
Control by USGS and NOS/NOAA
Topography by photogrammetric methods from aerial photographs taken 1969. Field checked 1971
Projection and 10,000-foot grid ticks: California coordinate system, zone 5 (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue. 1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 2 meters north and 82 meters east as shown by dashed corner ticks
Modification to USGS base map by the Geometronics Service Center from 1984 aerial photography and 1987 correction guides furnished by Pacific Southwest Region
Landnet revised according to additional Forest Service evidence
UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
National Forest Boundary
Alienated Land within the National Forest Boundary
TOWNSHIP AND SECTION LINE CLASSIFICATION
Surveyed, Location Reliable
Surveyed, Location Approximate
Unsurveyed, Protraction
Primary Highway
Secondary Highway
Improved Light Duty
Unimproved Dirt
Trail
Locked Gate
Road, Location Approximate
U.S. Highway
State Highway
County Road
Forest Highway
Forest Road
Forest Trail
Trail, Location Approximate
133-1 132-2 132-1
133-4 132-3 132-4
107-1 106-2 106-1
ADJACENT QUADRANGLE LOCATION DIAGRAM
LAKE ARROWHEAD, CALIF.
SW/4 LAKE ARROWHEAD 15' QUADRANGLE
N3415-W11707.5/7.5
1971
PHOTOREVISED 1988
DMA 2252 I SW—SERIES V895
132-3
REVISED 1989


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE
15
BUTLER PEAK QUADRANGLE
CALIFORNIA—SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 LAKE ARROWHEAD 15' QUADRANGLE
117°07'30"
34°22'30"
117°00'
34°15'
SAN BERNARDINO NATIONAL FOREST
DxF
DxE
DxG
FaE
FaF
DcDE
BoD
DdDE
DcF
DdDE
DaG
DdF
DaF
DaE
WpG
DhG
Base map prepared by the U.S. Geological Survey
Control by USGS, NOS/NOAA and USCE
Topography by photogrammetric methods from aerial photographs taken 1969. Field checked 1971
Projection and 10,000-foot grid ticks: California coordinate system, zone 5 (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue. 1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 2 meters north and 82 meters east as shown by dashed corner ticks
Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by Pacific Southwest Region
UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
National Forest Boundary
Alienated Land within the National Forest Boundary
TOWNSHIP AND SECTION LINE CLASSIFICATION
Surveyed, Location Reliable
Surveyed, Location Approximate
Unsurveyed, Protraction
Primary Highway
Secondary Highway
Improved Light Duty
Unimproved Dirt
Trail
Locked Gate
Road, Location Approximate
U.S. Highway
State Highway
County Road
Forest Highway
Forest Road
Forest Trail
Trail, Location Approximate
ADJACENT QUADRANGLE LOCATION DIAGRAM
132-2
132-1
131-2
132-3
132-4
131-3
106-2
106-1
105-2
BUTLER PEAK, CALIF.
SE/4 LAKE ARROWHEAD 15' QUADRANGLE
N3415—W11700/7.5
1971
PHOTOREVISED 1988
DMA 2552 I SE-SERIES V895
132-4
REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

16

FAWNSKIN QUADRANGLE
CALIFORNIA—SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 LUCERNE VALLEY 15' QUADRANGLE

Base map prepared by the U.S. Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1969. Field checked 1971

Projection and 10,000-foot grid ticks: California coordinate system, zone 5 (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid ticks, zone 11 1927 North American datum

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24,000

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- 395 U.S. Highway
- 71 State Highway
- 13 County Road
- 138 Forest Highway
- 2N18 Forest Road
- 18E7 Forest Trail
- Trail, Location Approximate

ADJACENT QUADRANGLE LOCATION DIAGRAM

132-1	131-2	131-1
132-4	131-3	131-4
186-1	186-2	186-1

FAWNSKIN, CALIF.
SW/4 LUCERNE VALLEY 15' QUADRANGLE
N3415—W11652.5/7.5

REVISED 1990

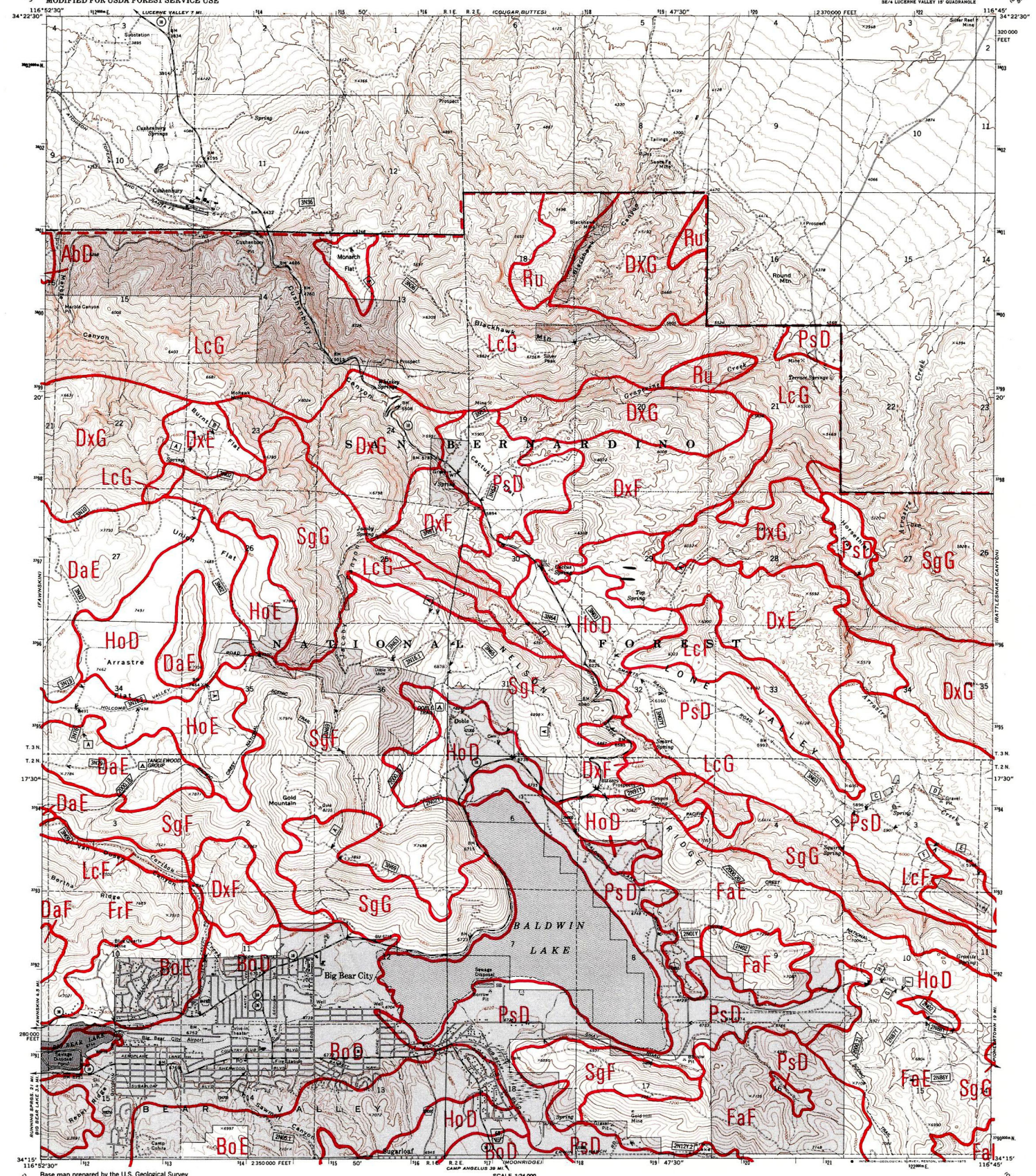
DMA 2652 IV SW—SERIES V895

131-3

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

17

BIG BEAR CITY QUADRANGLE
CALIFORNIA—SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 LUCERNE VALLEY 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1969. Field checked 1971

Projection and 10,000-foot grid ticks: California coordinate system, zone 5 (Lambert conformal conic)
1000-metre Universal Transverse Mercator grid ticks, zone 11, 1927 North American datum

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24,000

1 MILE
1 KILOMETER

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

131-2	131-1	130-2
131-3	131-4	130-3
105-2	105-1	104-2

ADJACENT QUADRANGLE LOCATION DIAGRAM

BIG BEAR CITY, CALIF.
SE/4 LUCERNE VALLEY 15' QUADRANGLE
N3415—W11645/7.5

1971

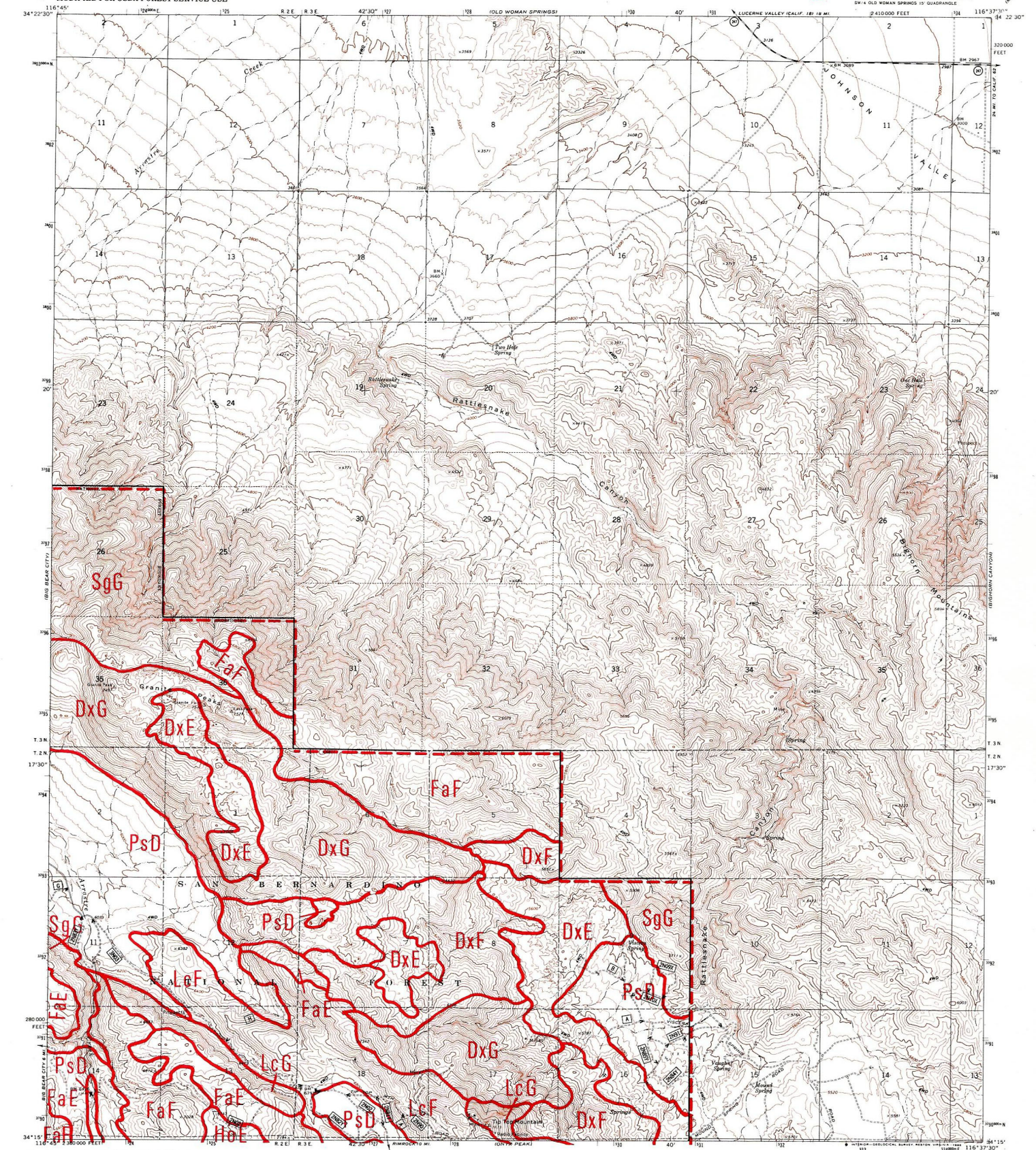
DMA 2852 IV SE—SERIES V895

131-4

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

RATTLESNAKE CANYON QUADRANGLE
CALIFORNIA—SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 OLD WOMAN SPRINGS 15' QUADRANGLE

18



Base map prepared by the U.S. Geological Survey
in cooperation with California Department of Water Resources
Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1970. Field checked 1972

Projection and 10,000-foot grid ticks: California coordinate system, zone 5 (Lambert conformal conic)
1000-metre Universal Transverse Mercator grid ticks, zone 11, shown in blue. 1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 2 meters north and 81 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

ADJACENT QUADRANGLE LOCATION DIAGRAM

131-1	130-2	130-1
131-4	130-3	130-4
105-1	104-2	104-1

RATTLESNAKE CANYON, CALIF.
SW/4 OLD WOMAN SPRINGS 15' QUADRANGLE
N3415—W11637.5/7.5

1972
PHOTOREVISED 1988
DMA 3652 I SW—SERIES V895

130-3
REVISED 1989

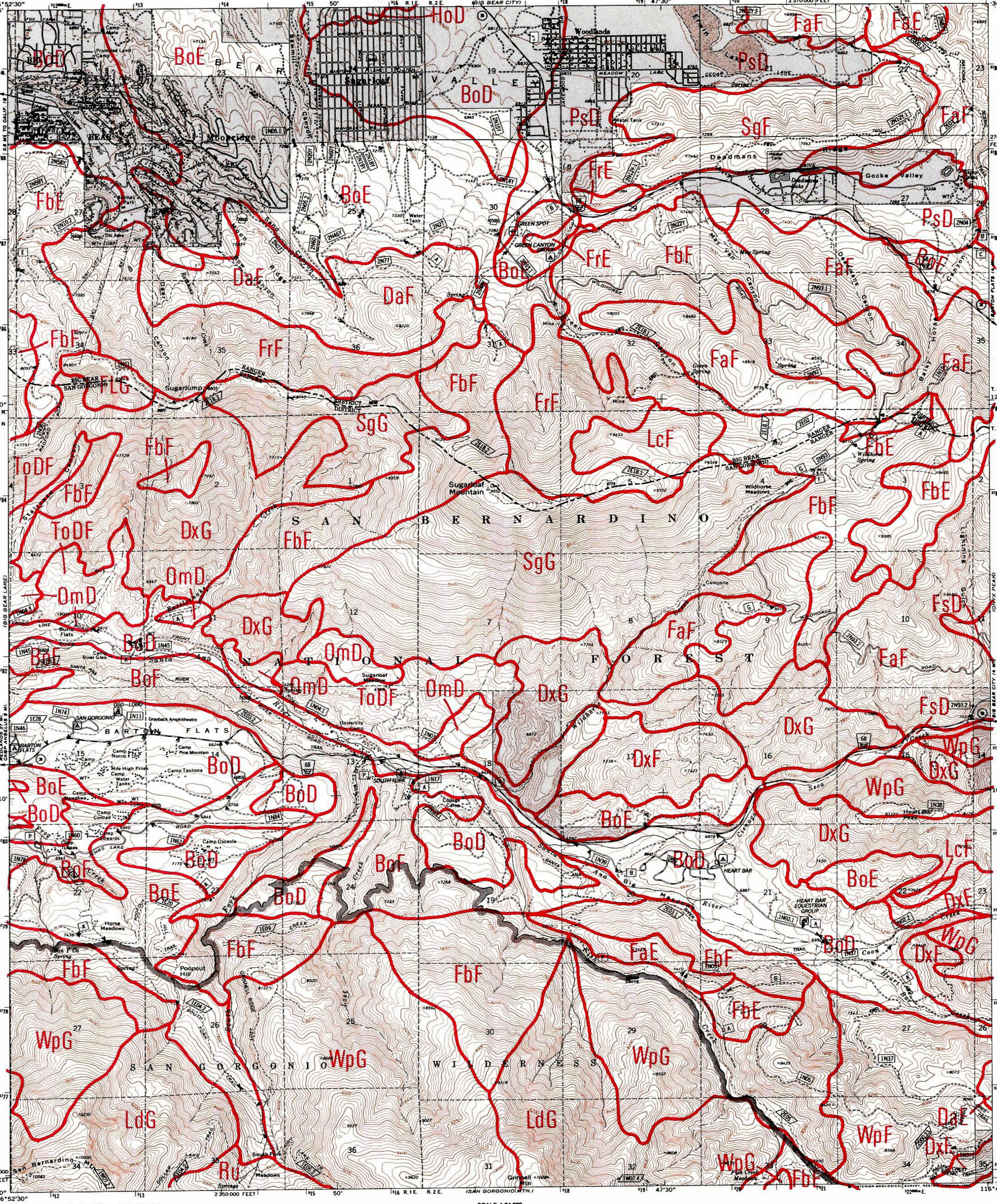
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE
21
ONYX PEAK QUADRANGLE
CALIFORNIA—SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 MORONGO VALLEY 15' QUADRANGLE
SAN BERNARDINO NATIONAL FOREST
Onyx Peak
Heartbreak Ridge
Old Timer Canyon
Juniper Springs
Round Valley
Deer Springs (Arrastre)
Trail Camp
Antelope Spring
Clevenga Spring
Little Morongo Canyon
Three Sisters Peaks
Big Morongo Canyon
Wide Canyon
Rattlesnake Canyon
Big Bear City 10 mi.
Big Bear City (Calif.) 18.7 mi.
Redlands 35 mi.
Yucca Valley (Calif.) 19.2 mi.
Morongo Valley
FaE
FaF
HoE
PsD
LcF
DxF
DxE
DxG
DaE
DaF
DaG
FrF
Rs
HoD
FbE
DdDE
FsD
BoE
BoD
DhG
WpG
WpF
SCALE 1:24,000
CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
Base map prepared by the U.S. Geological Survey
in cooperation with California Department of Water Resources
Control by USGS, NOS/NOAA, and USCE
Topography by photogrammetric methods from aerial photographs taken 1970. Field checked 1972
Projection and 10,000-foot grid ticks: California coordinate system, zone 5 (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue. 1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 1 meter north and 82 meters east as shown by dashed corner ticks
Modification to USGS base map by the Geometronics Service Center from 1984 aerial photography and 1987 correction guides furnished by Pacific Southwest Region
UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
National Forest Boundary
Alienated Land within the National Forest Boundary
TOWNSHIP AND SECTION LINE CLASSIFICATION
Surveyed, Location Reliable
Surveyed, Location Approximate
Unsurveyed, Protraction
Primary Highway
Secondary Highway
Improved Light Duty
Unimproved Dirt
Trail
Locked Gate
Road, Location Approximate
U.S. Highway
State Highway
County Road
Forest Highway
Forest Road
Forest Trail
Trail, Location Approximate
ADJACENT QUADRANGLE LOCATION DIAGRAM
131-4
130-3
130-4
105-1
104-2
104-1
105-4
104-3
104-4
ONYX PEAK, CALIF.
NW/4 MORONGO VALLEY 15' QUADRANGLE
N3407.5—W11637.5/7.5
1972
PHOTOREVISED 1988
DMA 2652 II NW—SERIES V895
104-2

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

MOONRIDGE QUADRANGLE

CALIFORNIA—SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NE/4 SAN GORGONIO MTN. 15' QUADRANGLE

22



Base map prepared by the U.S. Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1969. Field checked 1970

Projection and 10,000-foot grid ticks: California coordinate system, zone 5 (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue. 1927 North American Datum

To place on the predicted North American Datum 1983 move the projection lines 1 meter north and 81 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1983 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

0°08' 2 MILS — 13½° 240 MILS

SCALE 1:24,000

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

131-3	131-4	130-3
105-2	105-1	104-2
105-3	105-4	104-3

ADJACENT QUADRANGLE LOCATION DIAGRAM

MOONRIDGE, CALIF.
NE/4 SAN GORGONIO MTN. 15' QUADRANGLE
N3407.5—W11645/7.5

REVISED 1990
DMA 2652 III NE-SERIES V895

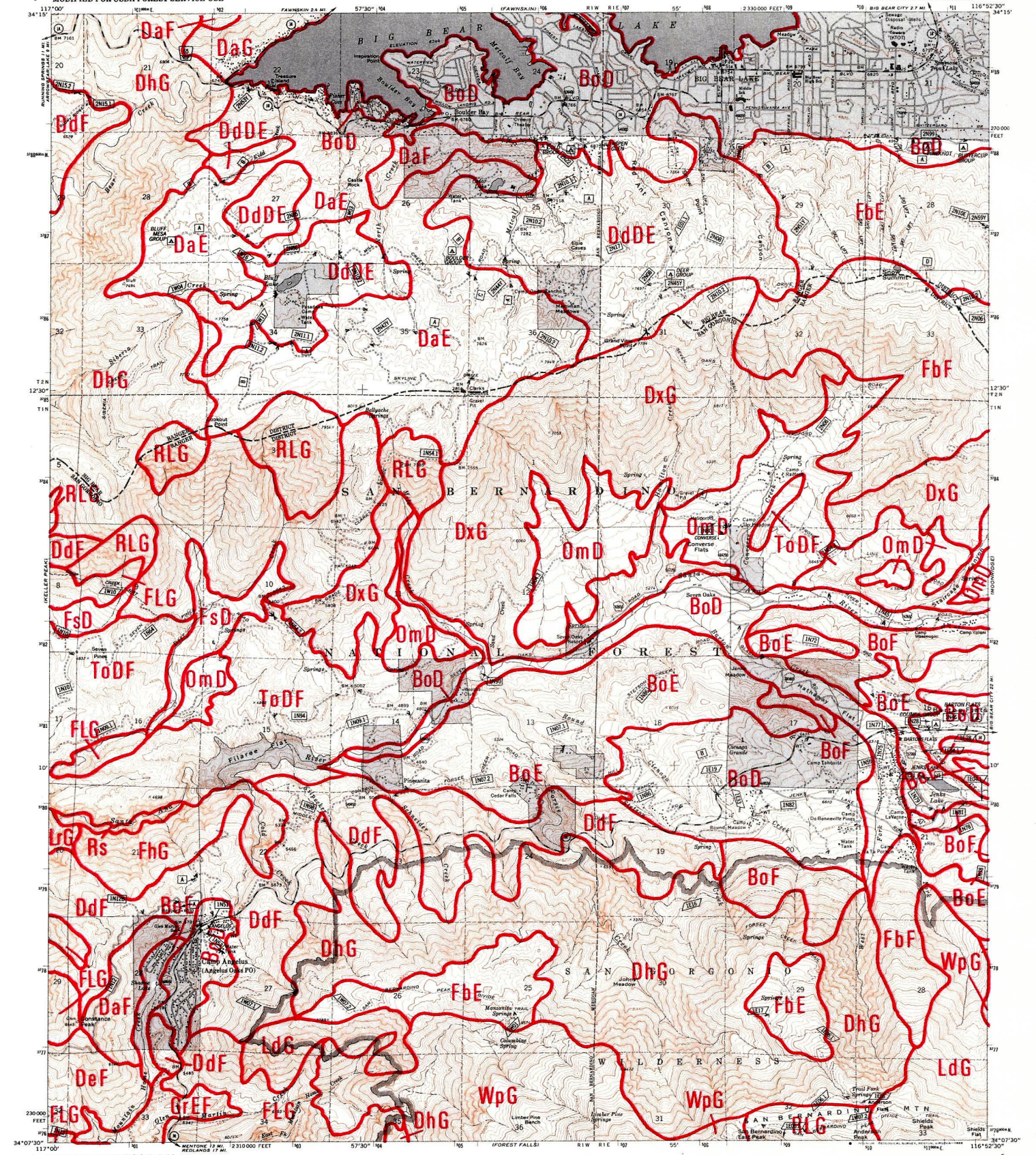
105-1

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

BIG BEAR LAKE QUADRANGLE
CALIFORNIA—SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

23

NW/4 SAN GORGONIO MTN. 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey

Control by USGS and NOS/ NOAA

Topography by photogrammetric methods from aerial photographs taken 1969. Field checked 1970

Projection and 10,000-foot grid ticks: California coordinate system, zone 5 (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue. 1927 North American Datum

To place on the predicted North American Datum 1983 move the projection lines 1 meter north and 82 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1983 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

ADJACENT QUADRANGLE LOCATION DIAGRAM

132-4	131-3	131-4
106-1	105-2	105-1
106-4	105-3	105-4

BIG BEAR LAKE, CALIF.
NW/4 SAN GORGONIO MTN 15' QUADRANGLE
N3407.5—W11652.5/7.5

1970
PHOTOREVISED 1988
DMA 2652 III NW—SERIES V895

105-2

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

24

KELLER PEAK QUADRANGLE
CALIFORNIA—SAN BERNARDINO CO
7.5 MINUTE SERIES (TOPOGRAPHIC)
NE/4 REDLANDS 15' QUADRANGLE

Base map prepared by the U.S. Geological Survey
Revised in cooperation with California Department of Water Resources

Control by USGS, NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1952. Field checked 1953. Revised from aerial photographs taken 1966. Field checked 1967

Polyconic projection. 1927 North American Datum
10,000-foot grid based on California coordinate system, zone 5
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue
To place on the predicted North American Datum 1983 move the projection lines 1 meter south and 82 meters east as shown by dashed corner ticks
Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region
Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

132-3	132-4	131-3
106-2	106-1	105-2
106-3	106-4	105-3

ADJACENT QUADRANGLE LOCATION DIAGRAM

KELLER PEAK, CALIF.
NE/4 REDLANDS 15' QUADRANGLE
N3407.5—W11700/7.5

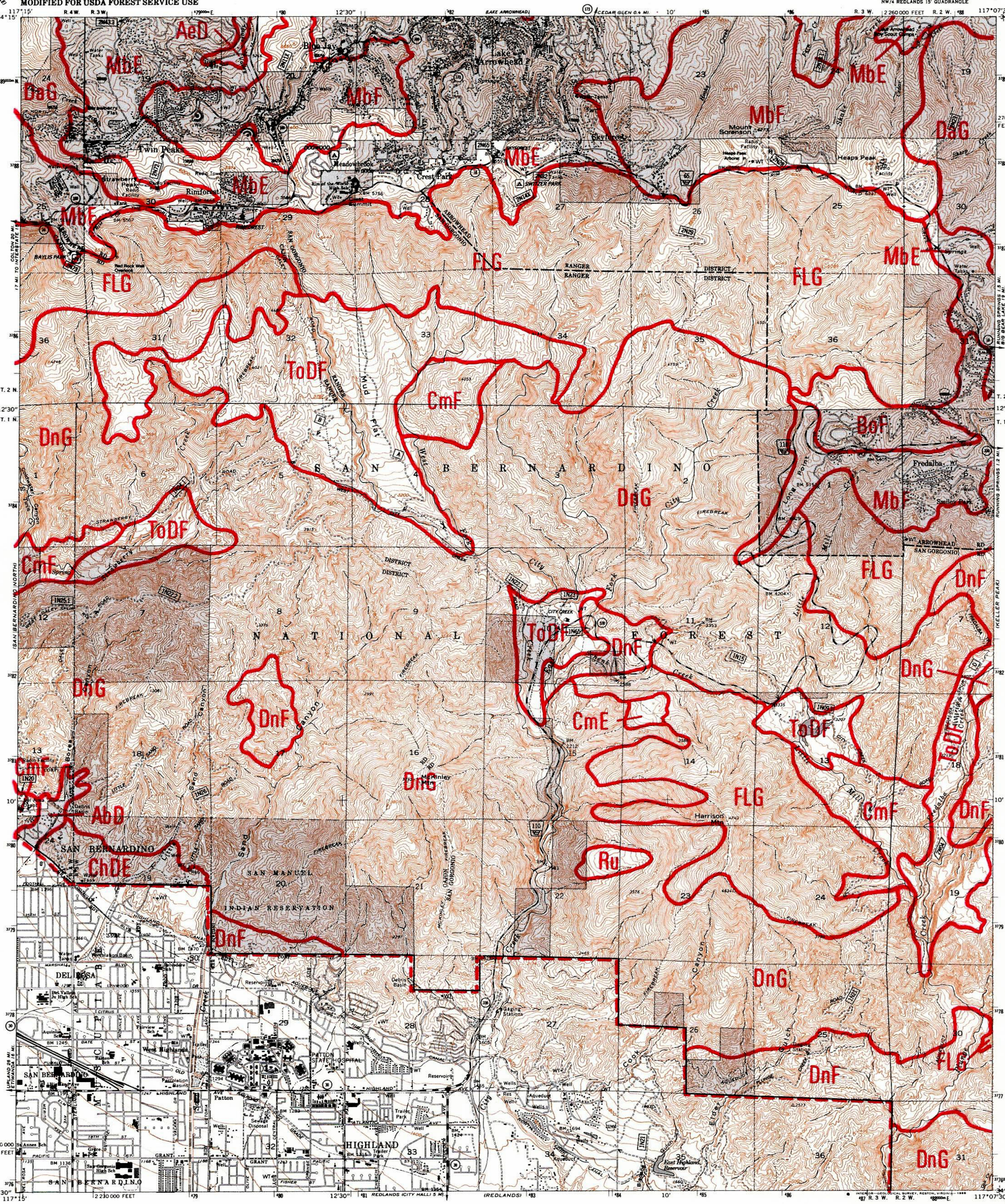
1967
PHOTOREVISED 1988
DMA 2552 II NE—SERIES V895

106-1

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

25 HARRISON MTN. QUADRANGLE
CALIFORNIA–SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 REDLANDS 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey
Revised in cooperation with California Department of Water Resources
Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1952. Field checked 1953. Revised from aerial photographs taken 1966. Field checked 1967

Polyconic projection 1927 North American Datum
10,000-foot grid based on California coordinate system, zone 5
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue.
To place on the predicted North American Datum 1983 move the projection lines 2 meters north and 82 meters east as shown by dashed corner ticks
Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region
Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

National Forest Boundary
Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
Surveyed, Location Reliable
Surveyed, Location Approximate
Unsurveyed, Protraction

Primary Highway
Secondary Highway
Improved Light Duty
Unimproved Dirt
Trail
Locked Gate
Road, Location Approximate

U.S. Highway
State Highway
County Road
Forest Highway
Forest Road
Forest Trail
Trail, Location Approximate

133-4	132-3	132-4
107-1	106-2	106-1
107-4	106-3	106-4

ADJACENT QUADRANGLE LOCATION DIAGRAM

HARRISON MTN., CALIF.
NW/4 REDLANDS 15' QUADRANGLE
N3407.5—W11707.5/7.5
1967
PHOTOREVISED 1988
DMA 2552 II NW—SERIES V895

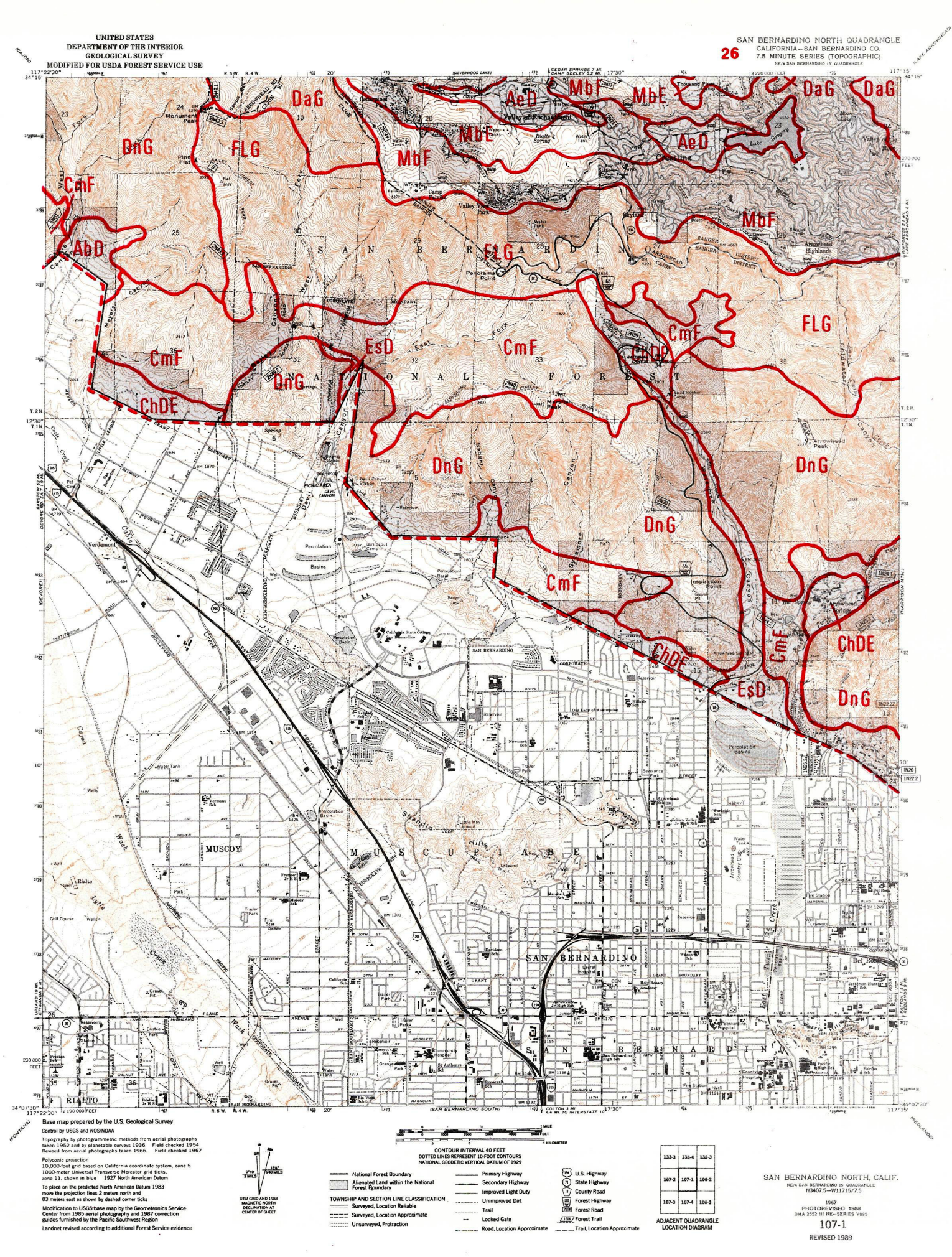
106-2

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

SAN BERNARDINO NORTH QUADRANGLE
CALIFORNIA—SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NE/4 SAN BERNARDINO 15' QUADRANGLE

26



UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

27

DEVORE QUADRANGLE
CALIFORNIA—SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 SAN BERNARDINO 15' QUADRANGLE

Base map prepared by the U.S. Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1952 and planetable surveys 1936 Field checked 1954. Revised from aerial photographs taken 1966. Field checked 1966

Polyconic projection 1927 North American Datum
10,000-foot grid based on California coordinate system, zone 5
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue

To place on the predicted North American Datum 1983 move the projection lines 2 meters north and 83 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

ADJACENT QUADRANGLE LOCATION DIAGRAM

134-4	133-3	133-4
108-1	107-2	107-1
108-4	107-3	107-4

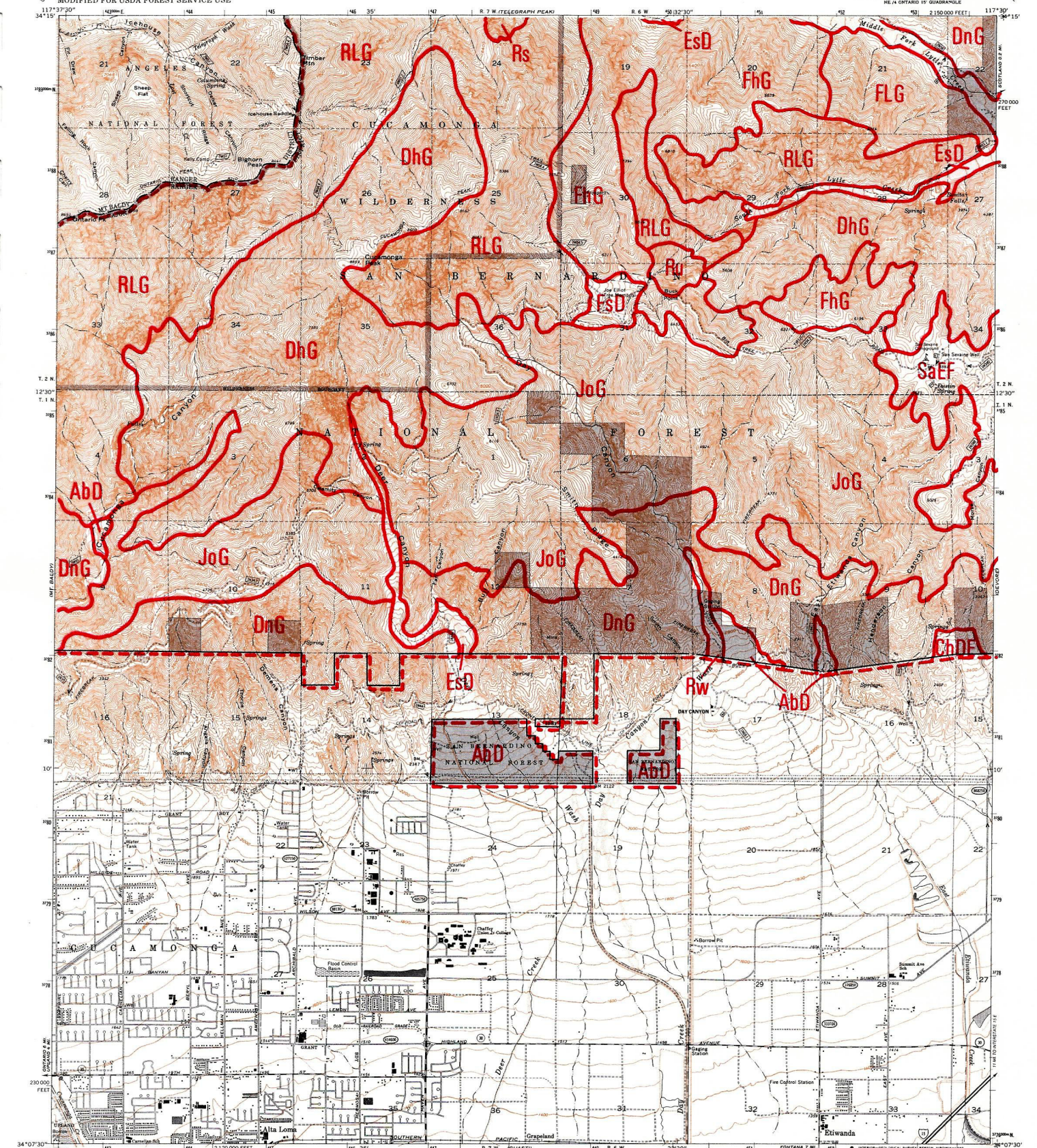
DEVORE, CALIF.
NW/4 SAN BERNARDINO 15' QUADRANGLE
N3407.5—W11722.5/7.5
1966
PHOTOREVISED 1988
DMA 2552 III NW—SERIES V895

107-2

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

CUCAMONGA PEAK QUADRANGLE
CALIFORNIA—SAN BERNARDINO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
ME/4 ONTARIO 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey
Revised in cooperation with California Department of Water Resources

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1952 and planetable surveys 1933. Field checked 1953
Revised from aerial photographs taken 1966. Field checked 1966

Polyconic projection
10,000-foot grid based on California coordinate system, zone 5
1000-meter Universal Transverse Mercator grid ticks, zone 11 1927 North American datum
Modification to U.S.G.S Base Map by the Geometronics Service Center from 1980 Aerial Photography and 1981 Correction Guides furnished by the Pacific Southwest Region.

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

LEGEND

- National Forest Boundary
- Alienated Land within the National Forest Boundary as of 1981

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

SAN BERNARDINO NATIONAL FOREST
QUADRANGLE LOCATION DIAGRAM

CUCAMONGA PEAK, CALIF.
ME/4 ONTARIO 15' QUADRANGLE
N3407.5—W11730/7.5

REVISED 1981

108-1C

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

MT. BALDY QUADRANGLE
CALIFORNIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 ONTARIO 15' QUADRANGLE

Base map prepared by the U.S. Geological Survey
Revised in cooperation with California Department of Water Resources

Control by USGS, NOS/NOAA and Los Angeles County

Topography by photogrammetric methods from aerial photographs taken 1952 and planetable surveys 1933. Field checked 1954
Revised from aerial photographs taken 1966. Field checked 1967

Polyconic projection. 1927 North American Datum
10,000-foot grids based on California coordinate system, zones 7 and 5
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue

To place on the predicted North American Datum 1983 move the projection lines 2 meters north and 84 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center form 1985-86 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

UTM GRID AND 1987 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Road, Paved
- Improved Road, Gravel
- Improved Road, Dirt
- Unimproved Dirt
- Trail
- Road, Location Approximate

- Interstate
- U.S. Highway
- State Highway
- County Road
- Primary Forest Route
- Forest Road
- Forest Trail
- Gate

ADJACENT QUADRANGLE LOCATION DIAGRAM

135-4	134-3	134-4
109-1	108-2	108-1
109-4	108-3	108-4

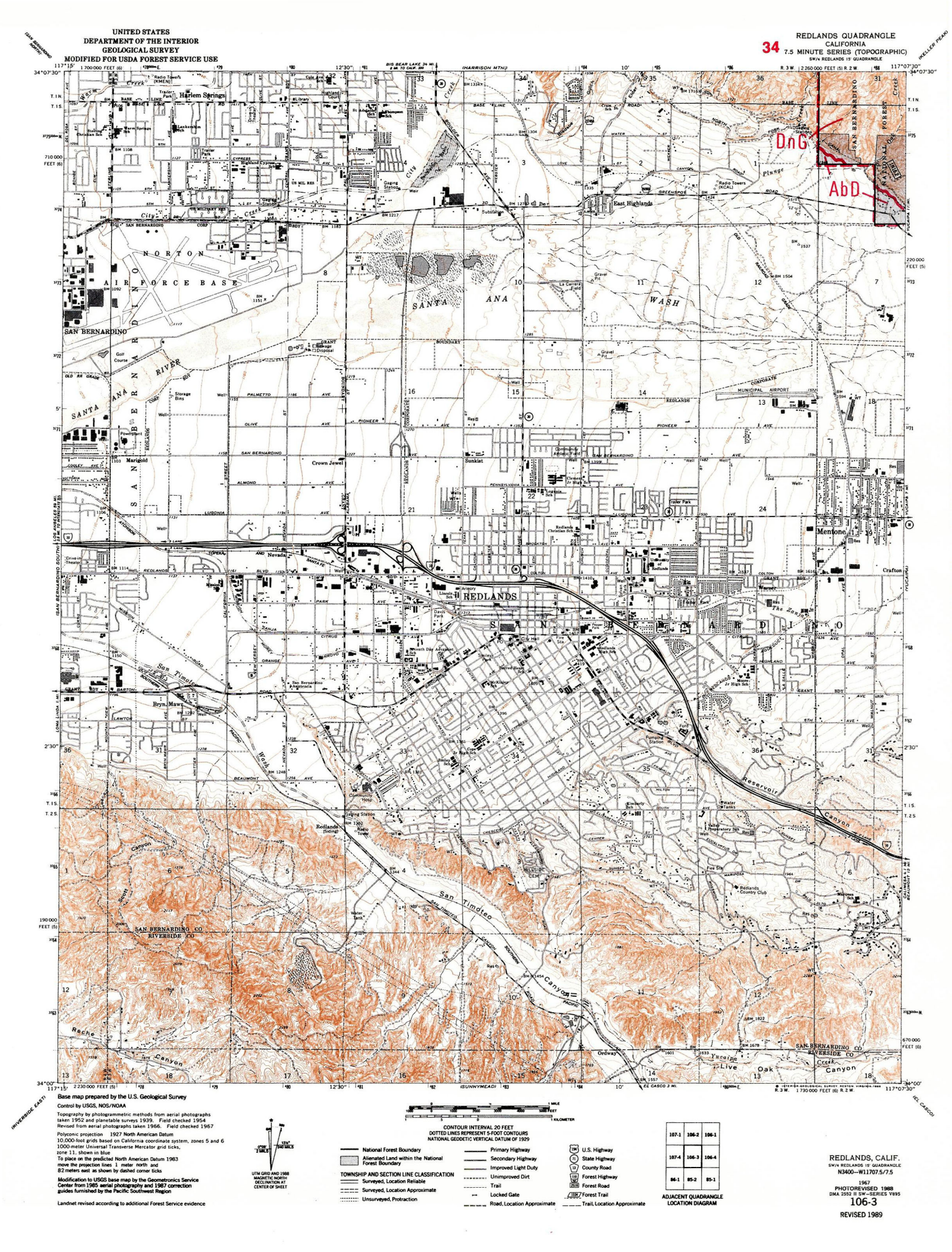
MT. BALDY, CALIF.
NW/4 ONTARIO 15' QUADRANGLE
N3407.5—W11737.5/7.5

1967
PHOTOREVISED 1988
DMA 2452 II NW—SERIES V895

108-2
REVISED 1988

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

REDLANDS QUADRANGLE
CALIFORNIA
34
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 REDLANDS 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey

Control by USGS, NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1952 and planetable surveys 1939. Field checked 1954
Revised from aerial photographs taken 1966. Field checked 1967

Polyconic projection 1927 North American Datum
10,000-foot grids based on California coordinate system, zones 5 and 6
1000-meter Universal Transverse Mercator grid ticks,
zone 11, shown in blue
To place on the predicted North American Datum 1983
move the projection lines 1 meter north and
82 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

ADJACENT QUADRANGLE LOCATION DIAGRAM

107-1	106-2	106-1
107-4	106-3	106-4
86-1	85-2	85-1

REDLANDS, CALIF.
SW/4 REDLANDS 15' QUADRANGLE
N3400—W11707.5/7.5

1967
PHOTOREVISED 1988
DMA 2552 II SW—SERIES V895

106-3

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

35

YUCAIPA QUADRANGLE
CALIFORNIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 REDLANDS 15' QUADRANGLE

Base map prepared by the U.S. Geological Survey

Control by USGS, NOS/NOAA, and USCE

Topography by photogrammetric methods from aerial photographs taken 1952 and planetable surveys 1939. Field checked 1954
Revised from aerial photographs taken 1966. Field checked 1967

Polyconic projection 1927 North American Datum
10,000-foot grids based on California coordinate system, zones 5 and 6
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue

To place on the predicted North American Datum 1983 move the projection lines 1 meter north and 82 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by Pacific Southwest Region

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

106-2	106-1	105-2
106-3	106-4	105-3
85-2	85-1	84-2

ADJACENT QUADRANGLE LOCATION DIAGRAM

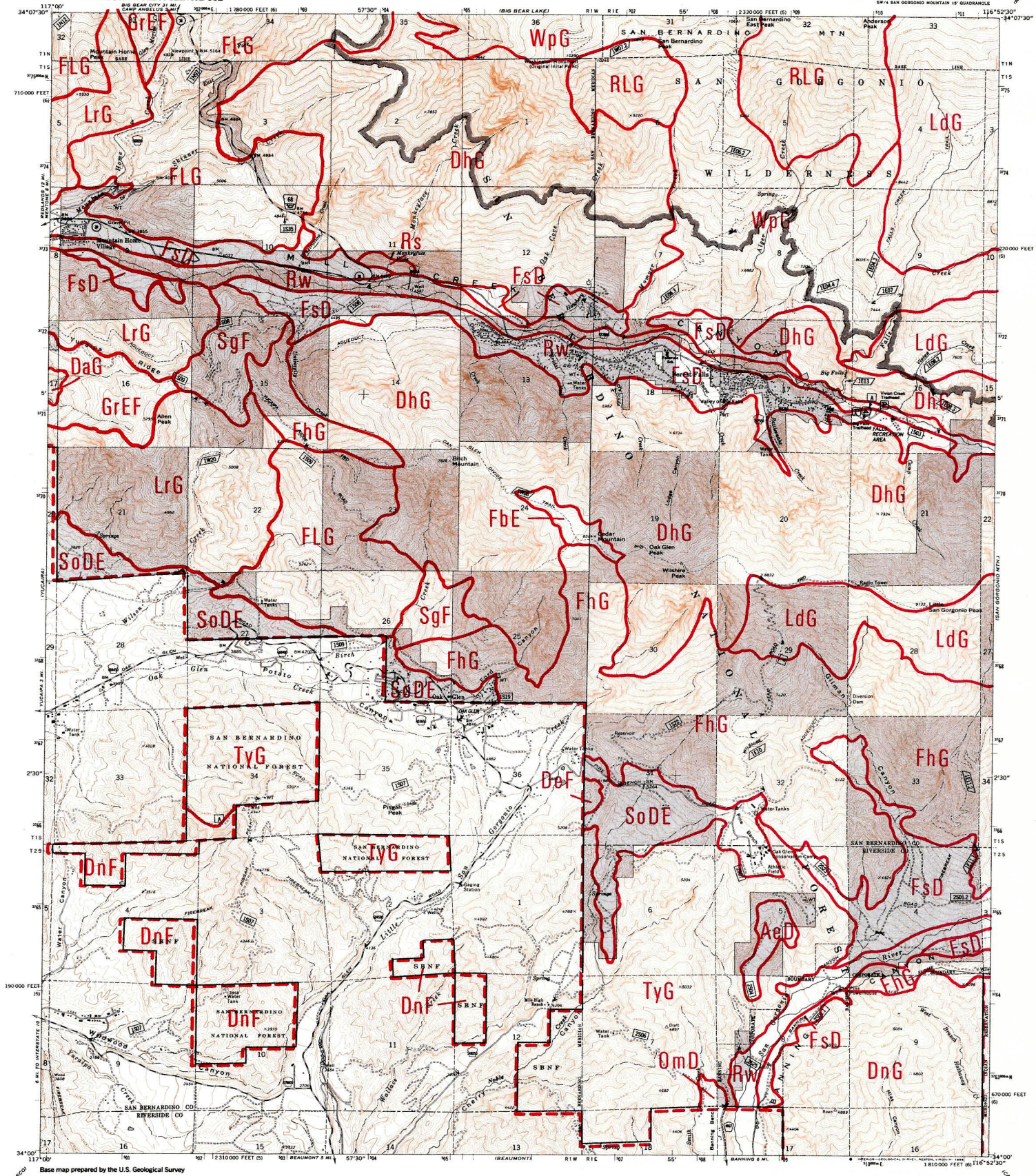
YUCAIPA, CALIF.
SE/4 REDLANDS 15' QUADRANGLE
N3400-W11700/7.5
1967
PHOTOREVISED 1988
DMA 2552 II SE--SERIES V895

106-4

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

FOREST FALLS QUADRANGLE
CALIFORNIA
36 7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 SAN GORGONIO MOUNTAIN 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey

Control by USGS, NOS/NOAA, and USCE

Topography by photogrammetric methods from aerial photographs taken 1969. Field checked 1970

Projection: California coordinate system, zone 5 (Lambert conformal conic)
10,000-foot grid ticks based on California coordinate system, zones 5 and 6
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue. 1927 North American Datum

To place on the predicted North American Datum 1983 move the projection lines 1 meter north and 82 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1983 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

ADJACENT QUADRANGLE LOCATION DIAGRAM

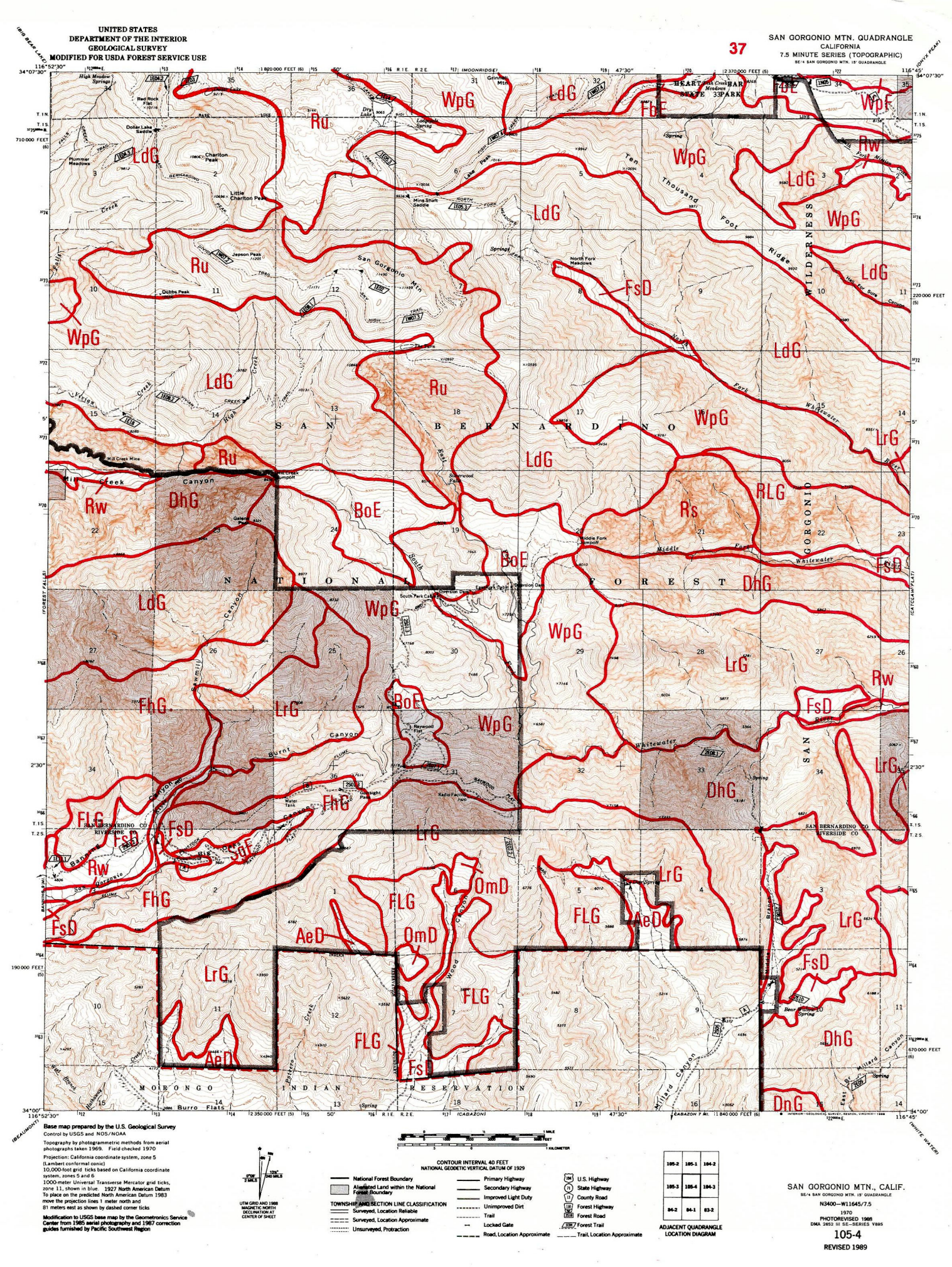
106-1	105-2	105-1
106-4	105-3	105-4
85-1	84-2	84-1

FOREST FALLS, CALIF.
SW/4 SAN GORGONIO MOUNTAIN 15' QUADRANGLE
N3400—W11652.5/7.5

1970
PHOTOREVISED 1988
DMA 2652 III SW—SERIES V895

105-3

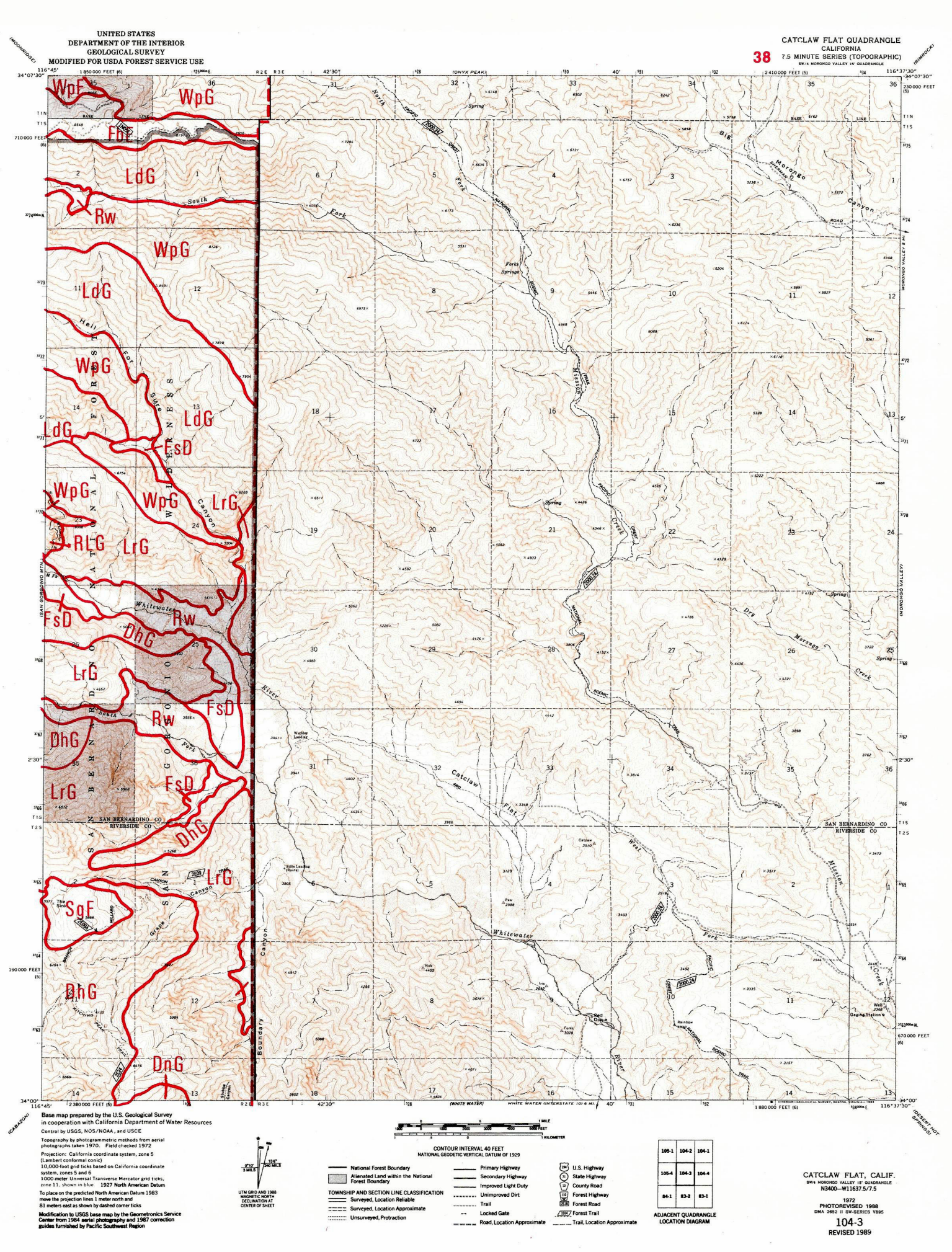
REVISED 1989


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE
37
SAN GORGONIO MTN. QUADRANGLE
CALIFORNIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 SAN GORGONIO MTN. 15' QUADRANGLE
116°52'30"
34°07'30"
116°45'
34°00'
SAN BERNARDINO NATIONAL FOREST
WILDERNESS
SAN GORGONIO
MORONGO INDIAN RESERVATION
SAN BERNARDINO CO
RIVERSIDE CO
WpG
WpF
LdG
Ru
RLG
Rs
Rw
DhG
BoE
FsD
LrG
FhG
FLG
SgE
OmD
AeD
DnG
Base map prepared by the U.S. Geological Survey
Control by USGS and NOS/NOAA
Topography by photogrammetric methods from aerial photographs taken 1969. Field checked 1970
Projection: California coordinate system, zone 5 (Lambert conformal conic)
10,000-foot grid ticks based on California coordinate system, zones 5 and 6
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue
1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 1 meter north and 81 meters east as shown by dashed corner ticks
Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by Pacific Southwest Region
UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
National Forest Boundary
Alienated Land within the National Forest Boundary
TOWNSHIP AND SECTION LINE CLASSIFICATION
Surveyed, Location Reliable
Surveyed, Location Approximate
Unsurveyed, Protraction
Primary Highway
Secondary Highway
Improved Light Duty
Unimproved Dirt
Trail
Locked Gate
Road, Location Approximate
U.S. Highway
State Highway
County Road
Forest Highway
Forest Road
Forest Trail
Trail, Location Approximate
ADJACENT QUADRANGLE LOCATION DIAGRAM
105-2
105-1
104-2
105-3
105-4
104-3
84-2
84-1
83-2
SAN GORGONIO MTN., CALIF.
SE/4 SAN GORGONIO MTN. 15' QUADRANGLE
N3400—W11645/7.5
1970
PHOTOREVISED 1988
DMA 2652 III SE—SERIES V895
105-4
REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

CATCLAW FLAT QUADRANGLE
CALIFORNIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 MORONGO VALLEY 15' QUADRANGLE

38



Base map prepared by the U.S. Geological Survey
in cooperation with California Department of Water Resources

Control by USGS, NOS/NOAA, and USCE

Topography by photogrammetric methods from aerial photographs taken 1970. Field checked 1972

Projection: California coordinate system, zone 5 (Lambert conformal conic)
10,000-foot grid ticks based on California coordinate system, zones 5 and 6
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue. 1927 North American Datum

To place on the predicted North American Datum 1983 move the projection lines 1 meter north and 81 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1984 aerial photography and 1987 correction guides furnished by Pacific Southwest Region

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

105-1	104-2	104-1
105-4	104-3	104-4
84-1	83-2	83-1

ADJACENT QUADRANGLE LOCATION DIAGRAM

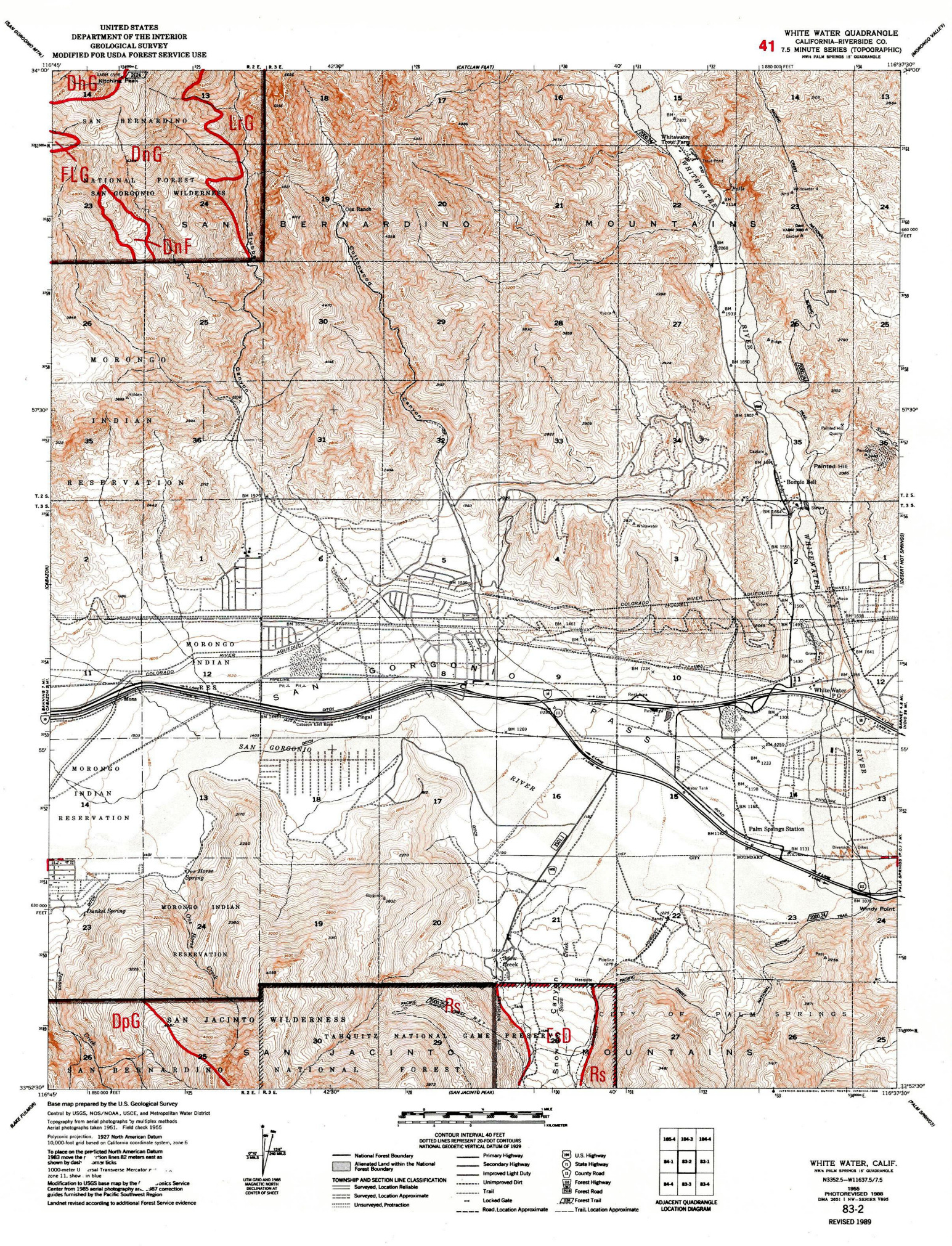
CATCLAW FLAT, CALIF.
SW/4 MORONGO VALLEY 15' QUADRANGLE
N3400—W11637.5/7.5

1972
PHOTOREVISED 1988
DMA 2652 II SW-SERIES V885

104-3
REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

WHITE WATER QUADRANGLE
CALIFORNIA—RIVERSIDE CO.
41 7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 PALM SPRINGS 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey

Control by USGS, NOS/NOAA, USCE, and Metropolitan Water District

Topography from aerial photographs by multiplex methods
Aerial photographs taken 1951. Field check 1955

Polyconic projection. 1927 North American Datum
10,000-foot grid based on California coordinate system, zone 6

To place on the predicted North American Datum 1983 move the ruling lines 82 meters east as shown by dashed tics

1000-meter Universal Transverse Mercator grid, zone 11, shown in blue

Modification to USGS base map by the Remote Sensing/Cartographics Service Center from 1985 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

ADJACENT QUADRANGLE LOCATION DIAGRAM

105-4	104-3	104-4
84-1	83-2	83-1
84-4	83-3	83-4

WHITE WATER, CALIF.
NW/4 PALM SPRINGS 15' QUADRANGLE
N3352.5—W11637.5/7.5
1955
PHOTOREVISED 1988
DMA 2651 I NW—SERIES V895

83-2

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

42 CABAZON QUADRANGLE
CALIFORNIA—RIVERSIDE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NE/4 BANNING 15' QUADRANGLE

Base map prepared by the U.S. Geological Survey

Control by USGS, NOS/NOAA, USCE, and Metropolitan Water District

Topography from aerial photographs by multiplex methods
Aerial photographs taken 1951. Field checked 1956

Polyconic projection. 1927 North American Datum
10,000-foot grid based on California coordinate system, zone 6
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue

To place on the predicted North American Datum 1983 move the projection lines 81 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by Pacific Southwest Region

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Allenated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

ADJACENT QUADRANGLE LOCATION DIAGRAM

105-3	105-4	104-3
84-2	84-1	83-2
84-3	84-4	83-3

CABAZON, CALIF.
NE/4 BANNING 15' QUADRANGLE
N3352.5—W11645/7.5

1956
PHOTOREVISED 1988
DMA 2651 IV NE—SERIES V895

84-1

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

BEAUMONT QUADRANGLE
CALIFORNIA-RIVERSIDE CO.
43 7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 BANNING 15' QUADRANGLE

DnG
DnF
AbD
SaaF

Base map prepared by the U.S. Geological Survey

Control by USGS, NOS/NOAA, and Metropolitan Water District of Southern California

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1949. Field check 1953

Polyconic projection. 1927 North American Datum
10,000-foot grid based on California coordinate system, zone 6
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue

To place on the predicted North American Datum 1983 move the projection lines 1 meters north and 82 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

Landnet revised according to additional Forest Servcie evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
DASHED LINES REPRESENT HALF INTERVAL CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

ADJACENT QUADRANGLE LOCATION DIAGRAM

106-4	105-3	105-4
85-1	84-2	84-1
85-4	84-3	84-4

BEAUMONT, CALIF.
NW/4 BANNING 15' QUADRANGLE
N3352.5—W11652.5/7.5

1953
PHOTOREVISED 1988
DMA 2651 IV NW—SERIES V895

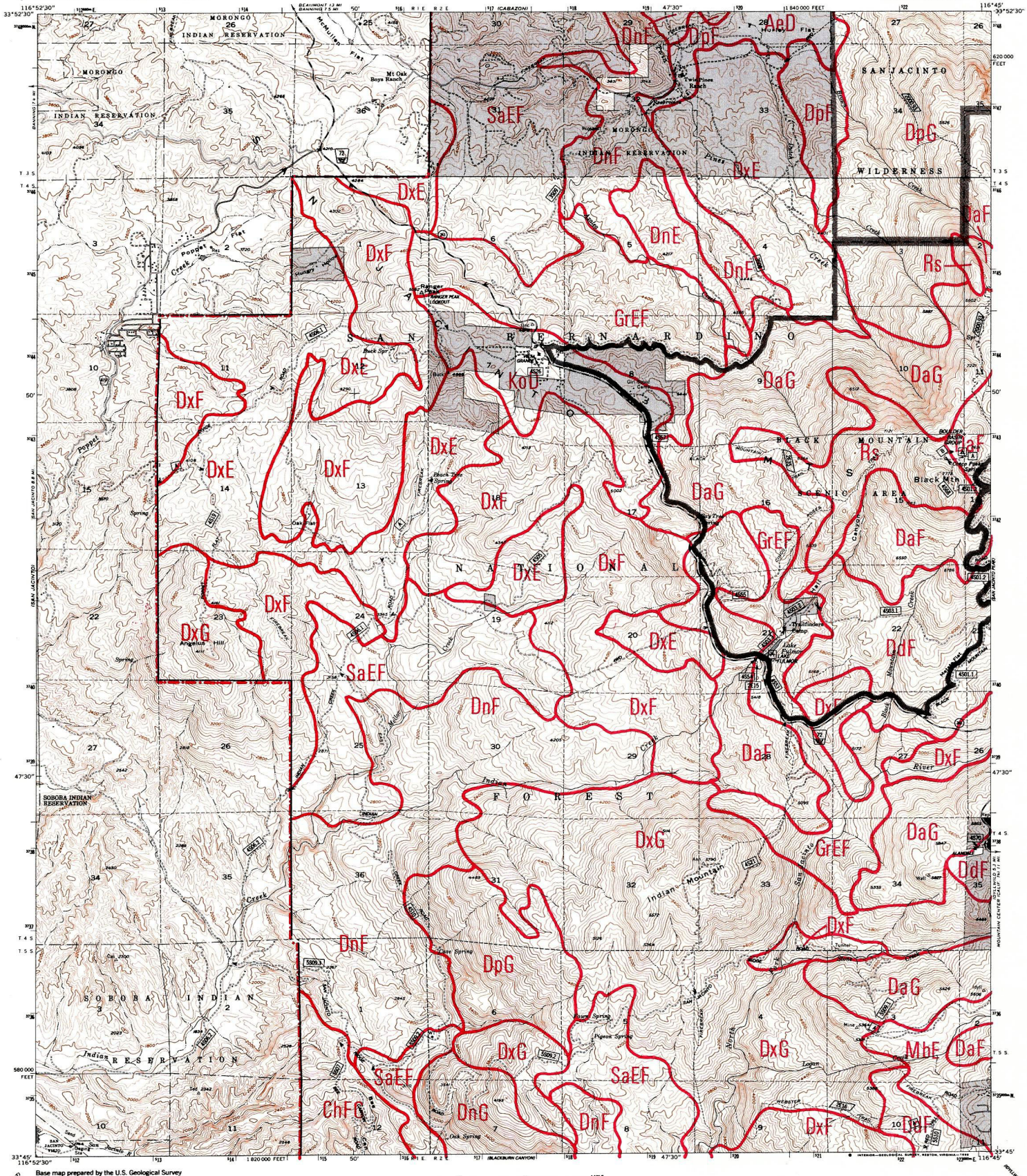
84-2

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

47

LAKE FULMOR QUADRANGLE
CALIFORNIA—RIVERSIDE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 BANNING 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey
Control by USCE

Topography from aerial photographs by multiplex methods
Aerial photographs taken 1951. Field checked 1956

Polyconic projection. 1927 North American Datum
10,000-foot grid based on California coordinate system, zone 6
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue

To place on the predicted North American Datum 1983 move the projection lines 81 meters east as shown by dashed corner ticks

Areas covered by dashed light-blue pattern are subject to controlled inundation

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

ADJACENT QUADRANGLE LOCATION DIAGRAM

84-2	84-1	83-2
84-3	84-4	83-3
67-2	67-1	66-2

LAKE FULMOR, CALIF.
SE/4 BANNING 15' QUADRANGLE
N3345-W11645/7.5
1956
PHOTOREVISED 1988
DMA 2651 IV SE—SERIES V895

84-4

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

48

SAN JACINTO PEAK QUADRANGLE
CALIFORNIA–RIVERSIDE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 PALM SPRINGS 15' QUADRANGLE

Base map prepared by the U.S. Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1975. Field checked 1976
Map edited 1981

Projection and 10,000-foot grid ticks: California coordinate system, zone 6 (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid, zone 11
1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 80 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 80 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

84-1	83-2	83-1
84-4	83-3	83-4
67-1	66-2	66-1

ADJACENT QUADRANGLE LOCATION DIAGRAM

SAN JACINTO PEAK, CALIF.
SW/4 PALM SPRINGS 15' QUADRANGLE
N3345—W11637.5/7.5

1981
PHOTOREVISED 1988
DMA 2651 I SW—SERIES V895

83-3

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
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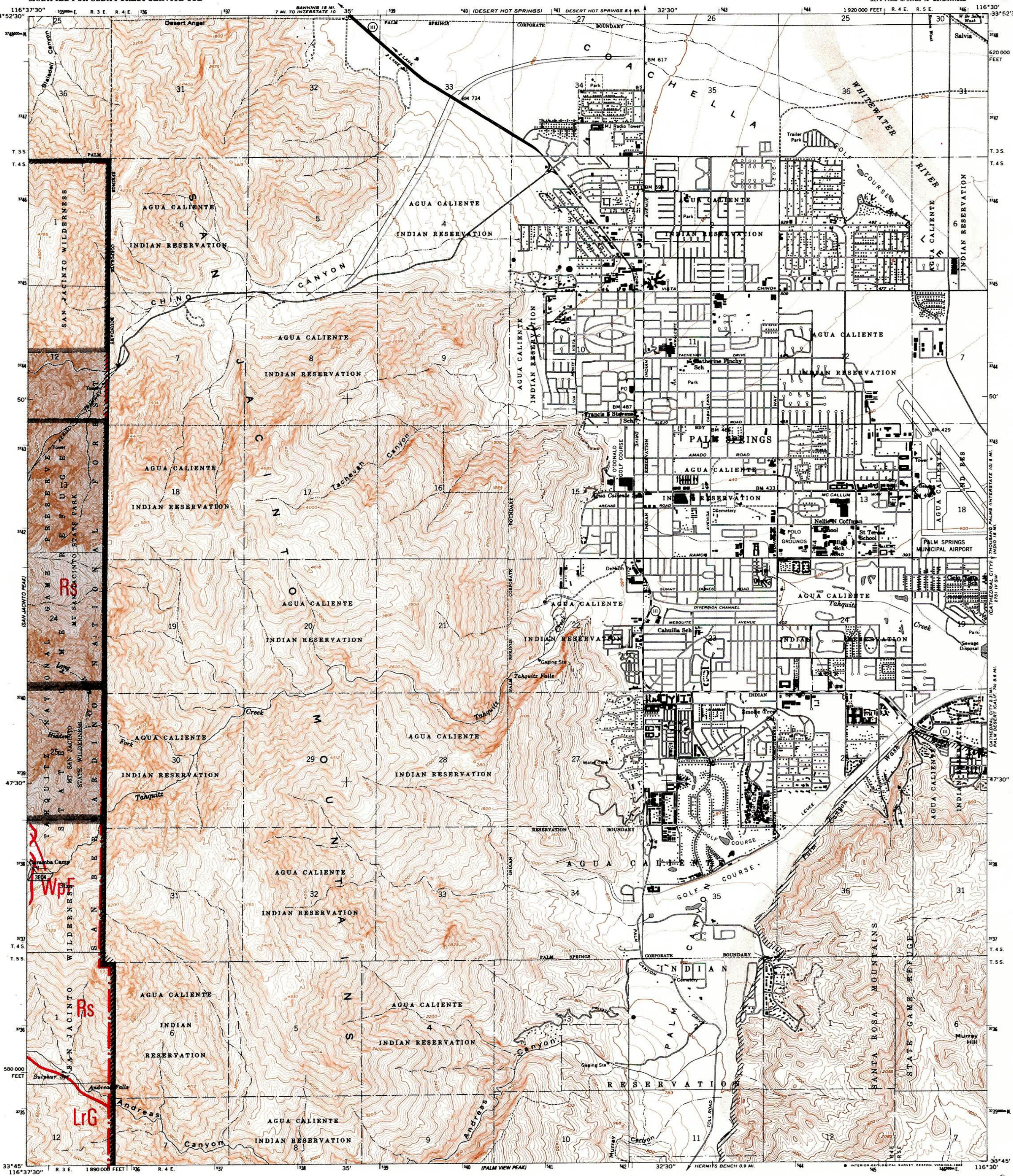
PALM SPRINGS QUADRANGLE
CALIFORNIA—RIVERSIDE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 PALM SPRINGS 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey
Control by USGS and NOS/NOAA
Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1955. Advance field check 1957

Polyconic projection
10,000-foot grid based on California coordinate system, zone 6
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue 1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 80 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1984 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
0°14' 4 MILS
13½° 240 MILS

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

83-2	83-1	82-2
83-3	83-4	82-3
66-2	66-1	65-2

ADJACENT QUADRANGLE LOCATION DIAGRAM

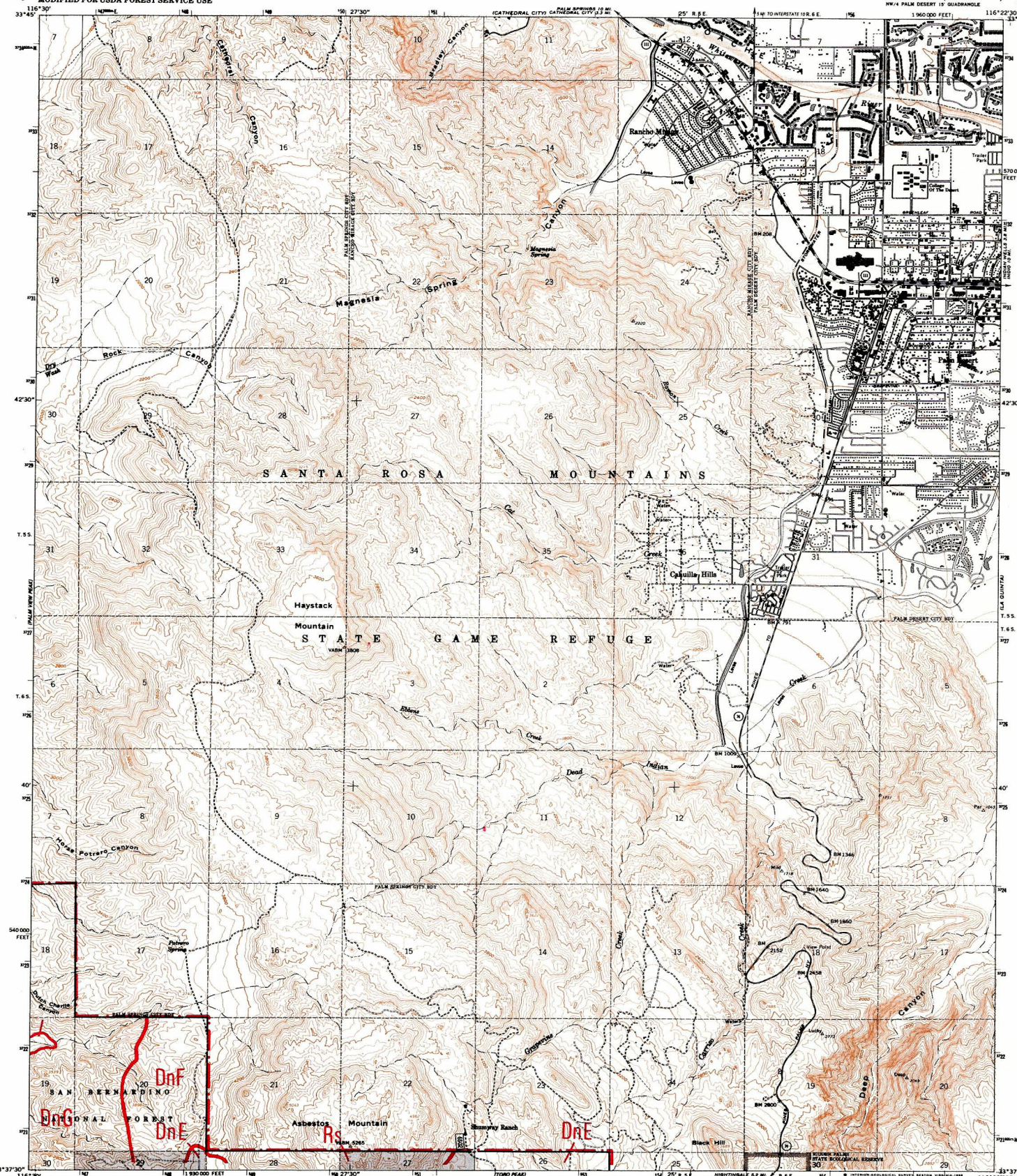
PALM SPRINGS, CALIF.
SE/4 PALM SPRINGS 15' QUADRANGLE
N3345—W11630/7.5
1957
PHOTOREVISED 1988
DMA 2651 I SE-SERIES V895

83-4

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

RANCHO MIRAGE QUADRANGLE
CALIFORNIA—RIVERSIDE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 PALM DESERT 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey
Control by USGS, NOS/NOAA, and USCE
Topography by photogrammetric methods from aerial photographs taken 1954. Field checked 1957
Polyconic projection. 1927 North American Datum
10,000-foot grid based on California coordinate system, zone 6
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue.
To place on the predicted North American Datum 1983 move the projection lines 1 meter south and 79 meters east as shown by dashed corner ticks
Modification to USGS base map by the Geomatronics Service Center from 1984 aerial photography and 1987 correction guides furnished by Pacific Southwest Region

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

ADJACENT QUADRANGLE LOCATION DIAGRAM

83-4	83-3	82-4
66-1	66-2	65-1
66-4	66-3	65-4

RANCHO MIRAGE, CALIF.
NW/4 PALM DESERT 15' QUADRANGLE
N3337.5—W11622.5/7.5

1957
PHOTOREVISED 1988
DMA 2751 III NW-SERIES V895

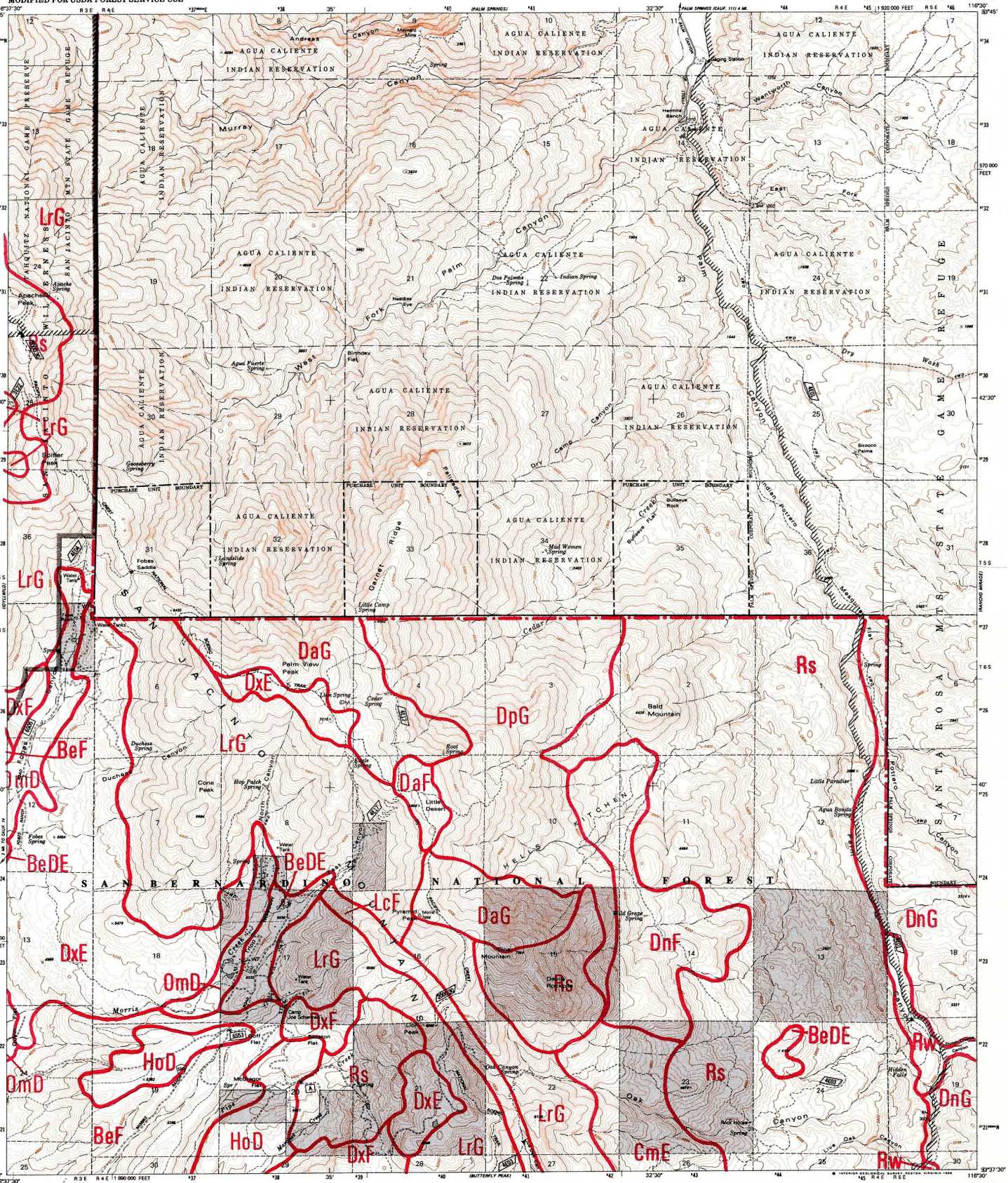
65-2

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

52

PALM VIEW PEAK QUADRANGLE
CALIFORNIA—RIVERSIDE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NE/4 IDYLLWILD 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey

Control by USGS, NOS/NOAA and USCE

Topography by photogrammetric methods from aerial photographs taken 1975. Field checked 1976
Map edited 1981

Projection and 10,000-foot grid ticks: California coordinate system, zone 6 (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid, zone 11
1927 North American Datum
To place on the predicted North American Datum move the projection lines 1 meter south and 80 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geomatronics Service Center from 1984 aerial photography and 1987 correction guides furnished by Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

83-3	83-4	82-3
66-2	66-1	65-2
66-3	66-4	65-3

ADJACENT QUADRANGLE LOCATION DIAGRAM

PALM VIEW PEAK, CALIF.
NE/4 IDYLLWILD 15' QUADRANGLE
N 3337.5—W11630/7.5

1951
PHOTOREVISED 1988
DMA 2651 II NE—SERIES V895

66-1

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
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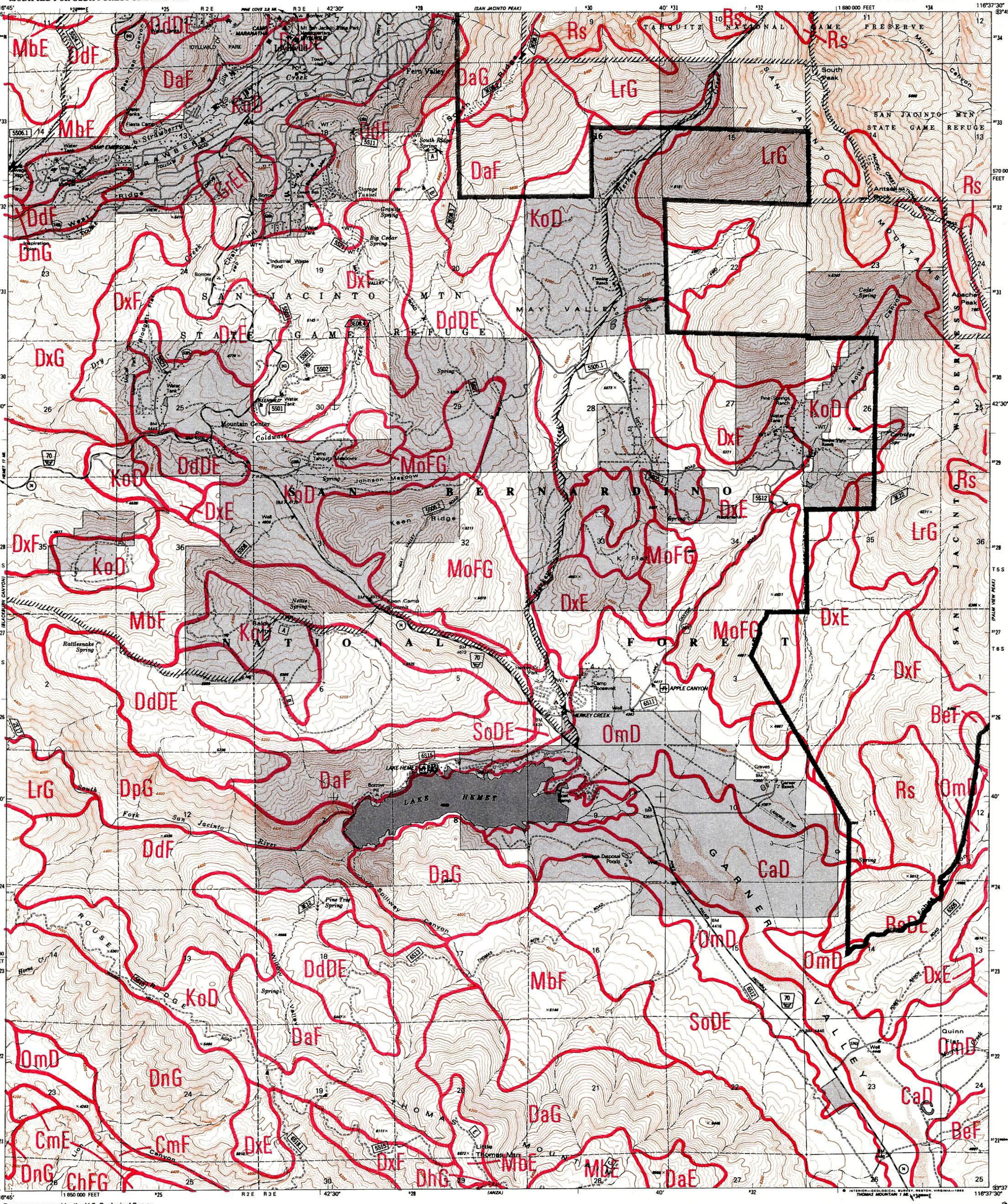
IDYLLWILD QUADRANGLE
CALIFORNIA–RIVERSIDE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NW/4 IDYLLWILD 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey

Control by USGS, NOS/NOAA and USCE

Topography by photogrammetric methods from aerial photographs taken 1975. Field checked 1976. Map edited 1981

Projection and 10,000-foot grid ticks: California coordinate system, zone 6 (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid, zone 11
1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 80 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

National Forest Boundary
Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
Surveyed, Location Reliable
Surveyed, Location Approximate
Unsurveyed, Protraction

Primary Highway
Secondary Highway
Improved Light Duty
Unimproved Dirt
Trail
Locked Gate
Road, Location Approximate

U.S. Highway
State Highway
County Road
Forest Highway
Forest Road
Forest Trail
Trail, Location Approximate

84-4	83-3	83-4
67-1	66-2	66-1
67-4	66-3	66-4

ADJACENT QUADRANGLE LOCATION DIAGRAM

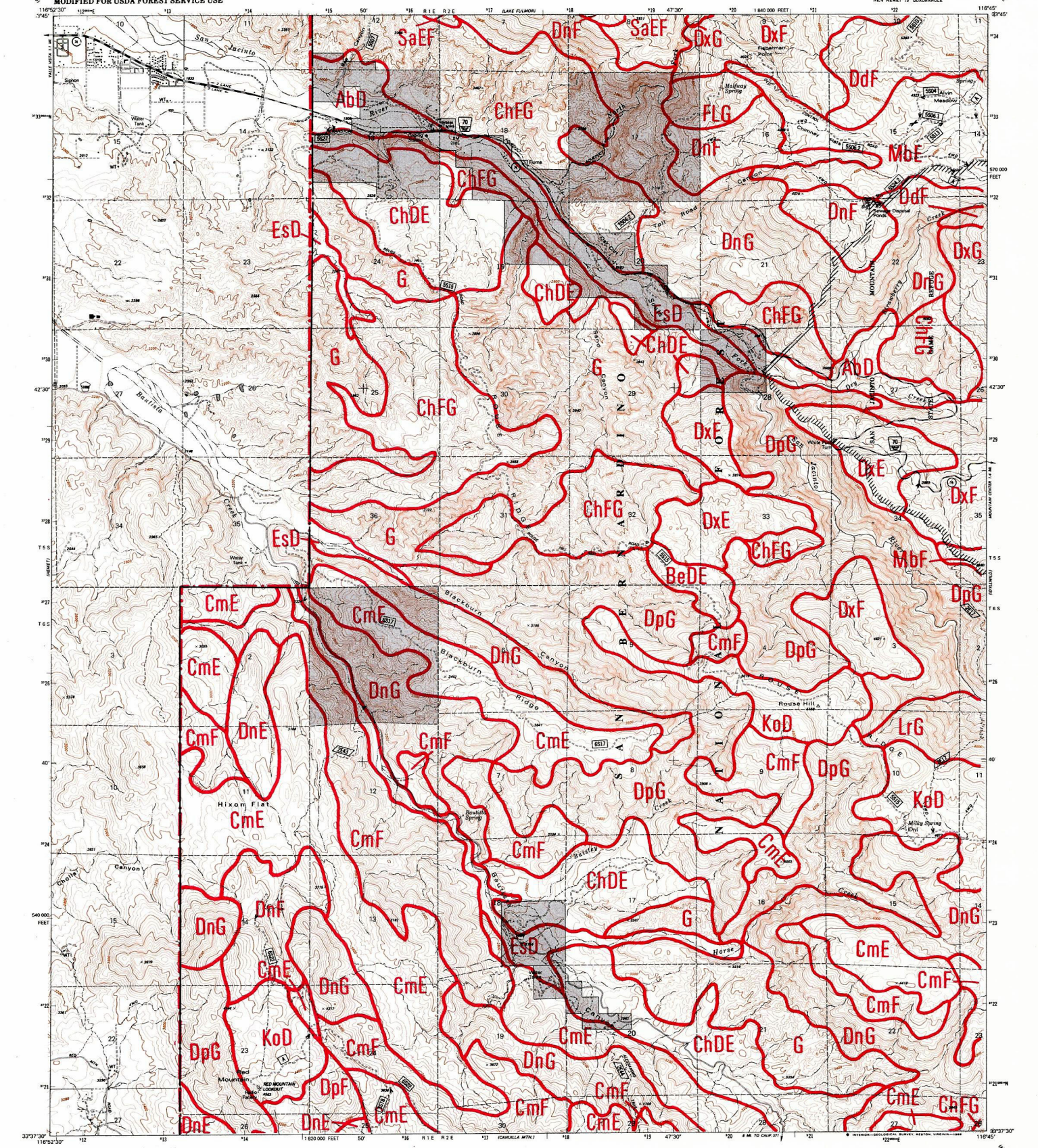
IDYLLWILD, CALIF.
NW/4 IDYLLWILD 15' QUADRANGLE
N3337.5—W11637.5/7.5

1981
PHOTOREVISED 1988
DMA 2651 II NW—SERIES V895
66-2

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

BLACKBURN CANYON QUADRANGLE
CALIFORNIA–RIVERSIDE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NE/4 HEMET 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey

Control by USGS, NOS/NOAA and USCE

Topography by photogrammetric methods from aerial photographs taken 1975. Field checked 1976
Map edited 1982

Projection and 10,000-foot grid ticks: California coordinate system, zone 6 (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid, zone 11
1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 81 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- (18) U.S. Highway
- (71) State Highway
- (13) County Road
- (18) Forest Highway
- (2S16) Forest Road
- (18E7) Forest Trail
- Trail, Location Approximate

84-3	84-4	83-3
67-2	67-1	66-2
67-3	67-4	66-3

ADJACENT QUADRANGLE LOCATION DIAGRAM

BLACKBURN CANYON, CALIF.
NE/4 HEMET 15' QUADRANGLE
N3337.5—W11645/7.5

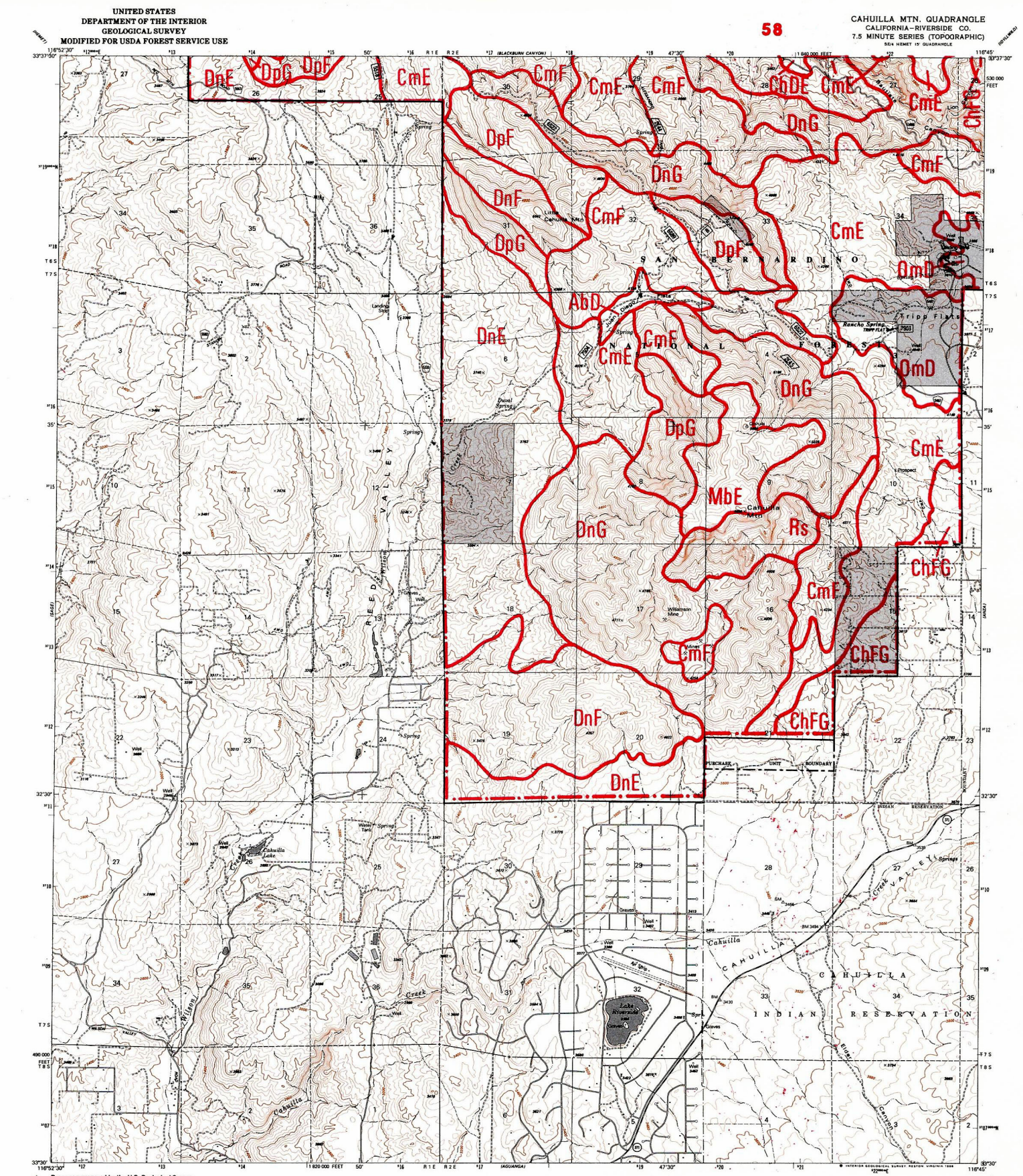
1982
PHOTOREVISED 1988
DMA 2851 III NE—SERIES V895

67-1

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

CAHUILLA MTN. QUADRANGLE
CALIFORNIA—RIVERSIDE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 HEMET 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey

Control by USGS, NOS/NOAA and USCE

Topography by photogrammetric methods from aerial photographs taken 1975. Field checked 1976. Map edited 1981

Projection and 10,000-foot grid ticks: California coordinate system, zone 6 (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid, zone 11
1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 1 meter south and 81 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1985 aerial photography and 1987 correction guides furnished by Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

ADJACENT QUADRANGLE LOCATION DIAGRAM

67-2	67-1	66-2
67-3	67-4	66-3
68-2	68-1	68-2

CAHUILLA MTN., CALIF.
SE/4 HEMET 15' QUADRANGLE
N3330—W11645/7.5

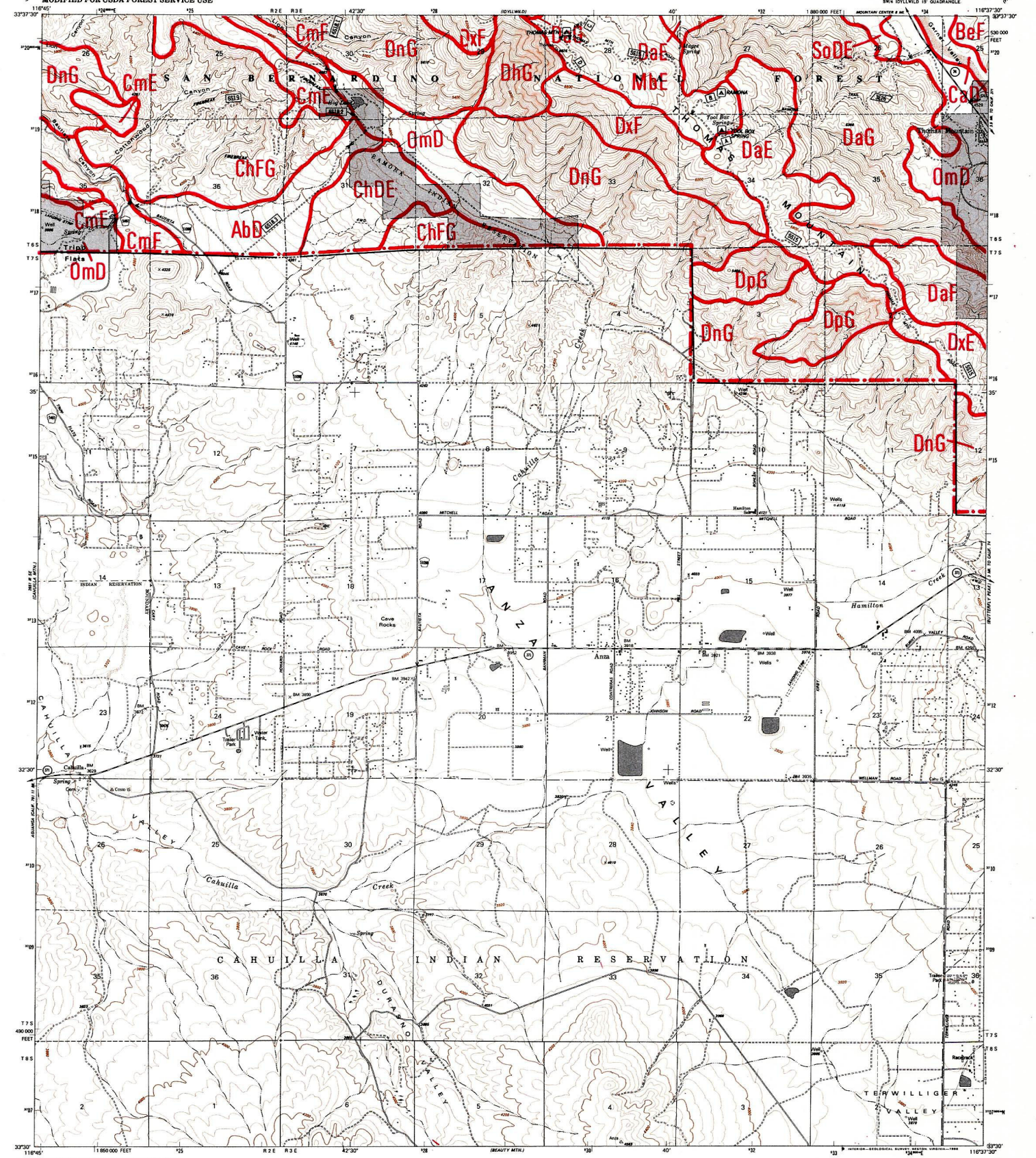
1981
PHOTOREVISED 1988
DMA 2651 III SE—SERIES V895

67-4

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

ANZA QUADRANGLE
CALIFORNIA–RIVERSIDE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 IDYLLWILD 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey

Control by USGS, NOS/NOAA, and USCE

Topography by photogrammetric methods from aerial photographs taken 1975. Field checked 1976. Map edited 1981

Projection and 10,000-foot grid ticks: California coordinate system, zone 6 (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid, zone 11
1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 1 meter south and 80 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1987 aerial photography and 1987 correction guides furnished by Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- 74 U.S. Highway
- 71 State Highway
- 17 County Road
- 132 Forest Highway
- 2S18 Forest Road
- 15E4 Forest Trail
- Trail, Location Approximate

ADJACENT QUADRANGLE LOCATION DIAGRAM

67-1	66-2	66-1
67-4	66-3	66-4
49-1	48-2	48-1

ANZA, CALIF.
SW/4 IDYLLWILD 15' QUADRANGLE
N3330—W11637.5/7.5

1981
PHOTOREVISED 1988
DMA 2851 II SW—SERIES V895

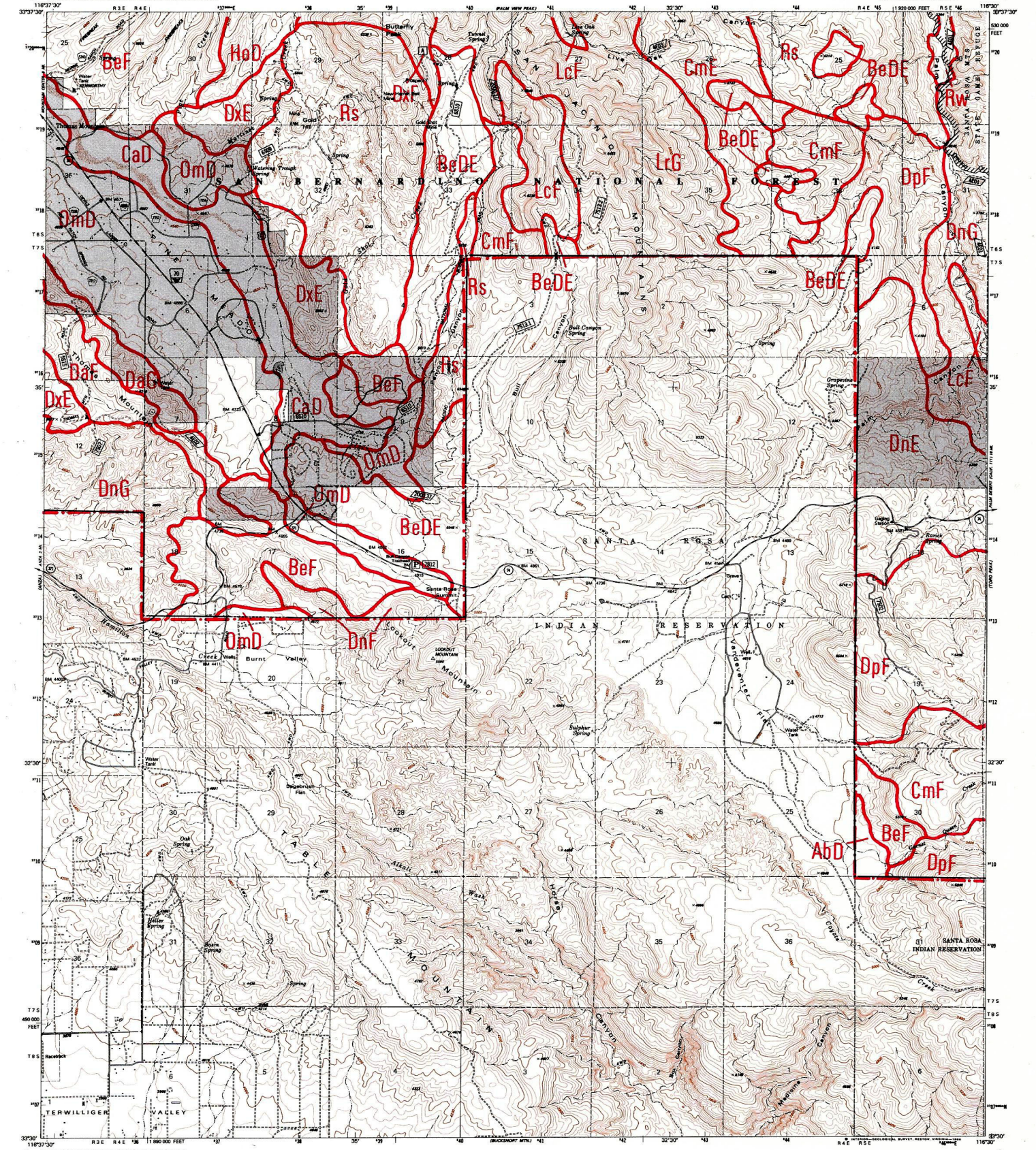
66-3

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

60

BUTTERFLY PEAK QUADRANGLE
CALIFORNIA–RIVERSIDE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 IDYLLWILD 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey

Control by USGS, NOS/NOAA, and USCE

Topography by photogrammetric methods from aerial photographs taken 1975. Field checked 1976. Map edited 1981

Projection and 10,000-foot grid ticks: California coordinate system, zone 6 (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid, zone 11
1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 1 meter south and 80 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1984 aerial photography and 1987 correction guides furnished by Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

National Forest Boundary
Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
Surveyed, Location Reliable
Surveyed, Location Approximate
Unsurveyed, Protraction

66-2	66-1	65-2
66-3	66-4	65-3
66-2	66-1	67-2

ADJACENT QUADRANGLE LOCATION DIAGRAM

BUTTERFLY PEAK, CALIF.
SE/4 IDYLLWILD 15' QUADRANGLE
N3330—W11630/7.5

1981
PHOTOREVISED 1988
DMA 3851 II SE—SERIES V895

66-4

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

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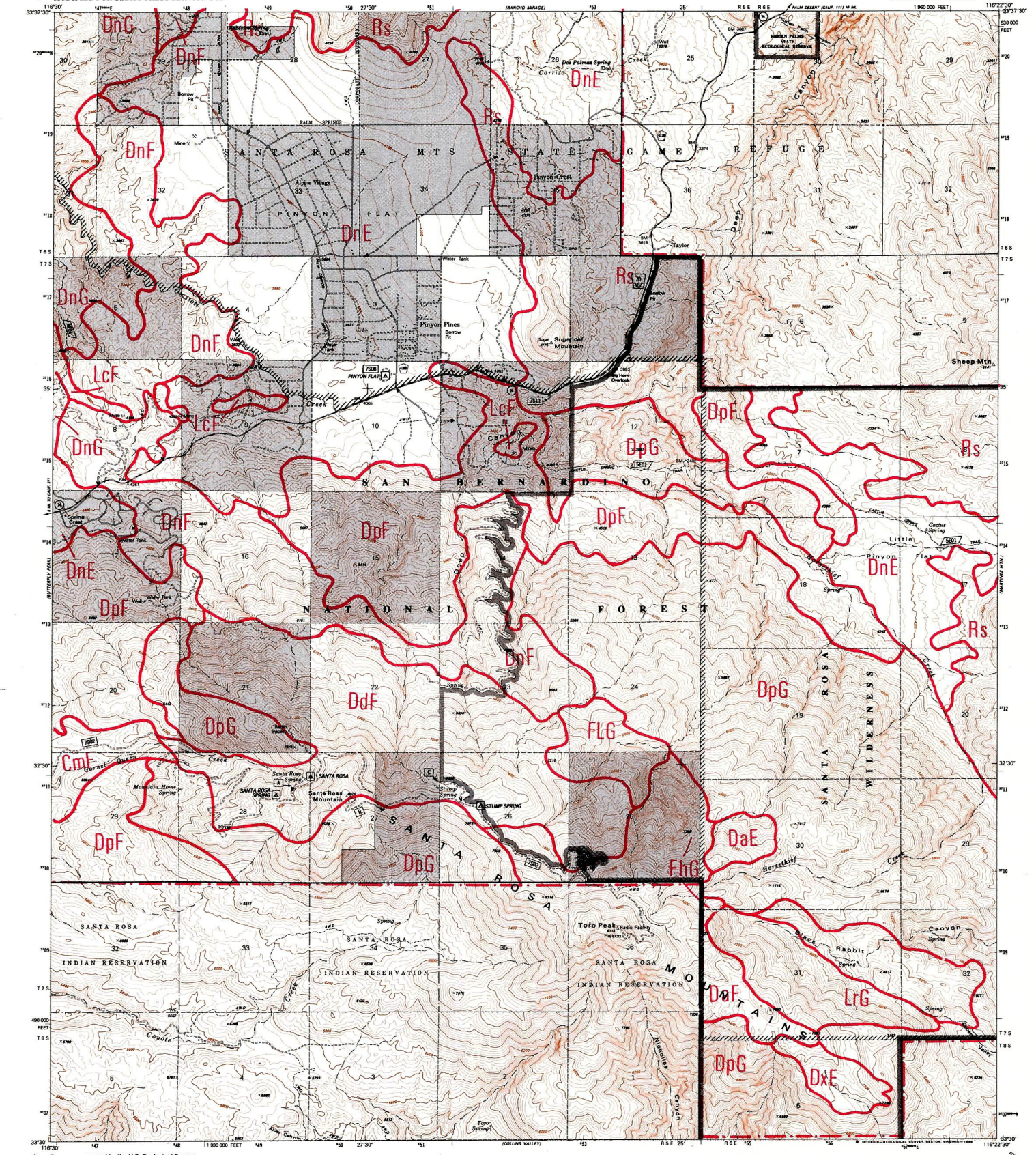
TORO PEAK QUADRANGLE
CALIFORNIA—RIVERSIDE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 PALM DESERT 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey

Control by USGS, NOS/NOAA and USCE

Topography by photogrammetric methods from aerial photographs taken 1975. Field checked 1976
Map edited 1981

Projection and 10,000-foot grid ticks: California coordinate system, zone 6 (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid, zone 11
1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 1 meter south and 79 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 198 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

Landnet revised according to additional Forest Service evidence

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

- National Forest Boundary
- Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
- Surveyed, Location Reliable
- Surveyed, Location Approximate
- Unsurveyed, Protraction

- Primary Highway
- Secondary Highway
- Improved Light Duty
- Unimproved Dirt
- Trail
- Locked Gate
- Road, Location Approximate

- U.S. Highway
- State Highway
- County Road
- Forest Highway
- Forest Road
- Forest Trail
- Trail, Location Approximate

ADJACENT QUADRANGLE LOCATION DIAGRAM

66-1	65-2	65-1
66-4	65-3	65-4
48-1	47-2	47-1

TORO PEAK, CALIF.
SW/4 PALM DESERT 15' QUADRANGLE
N3330—W11622.5/7.5

1981
PHOTOREVISED 1988
DMA 2751 II SW—SERIES V895

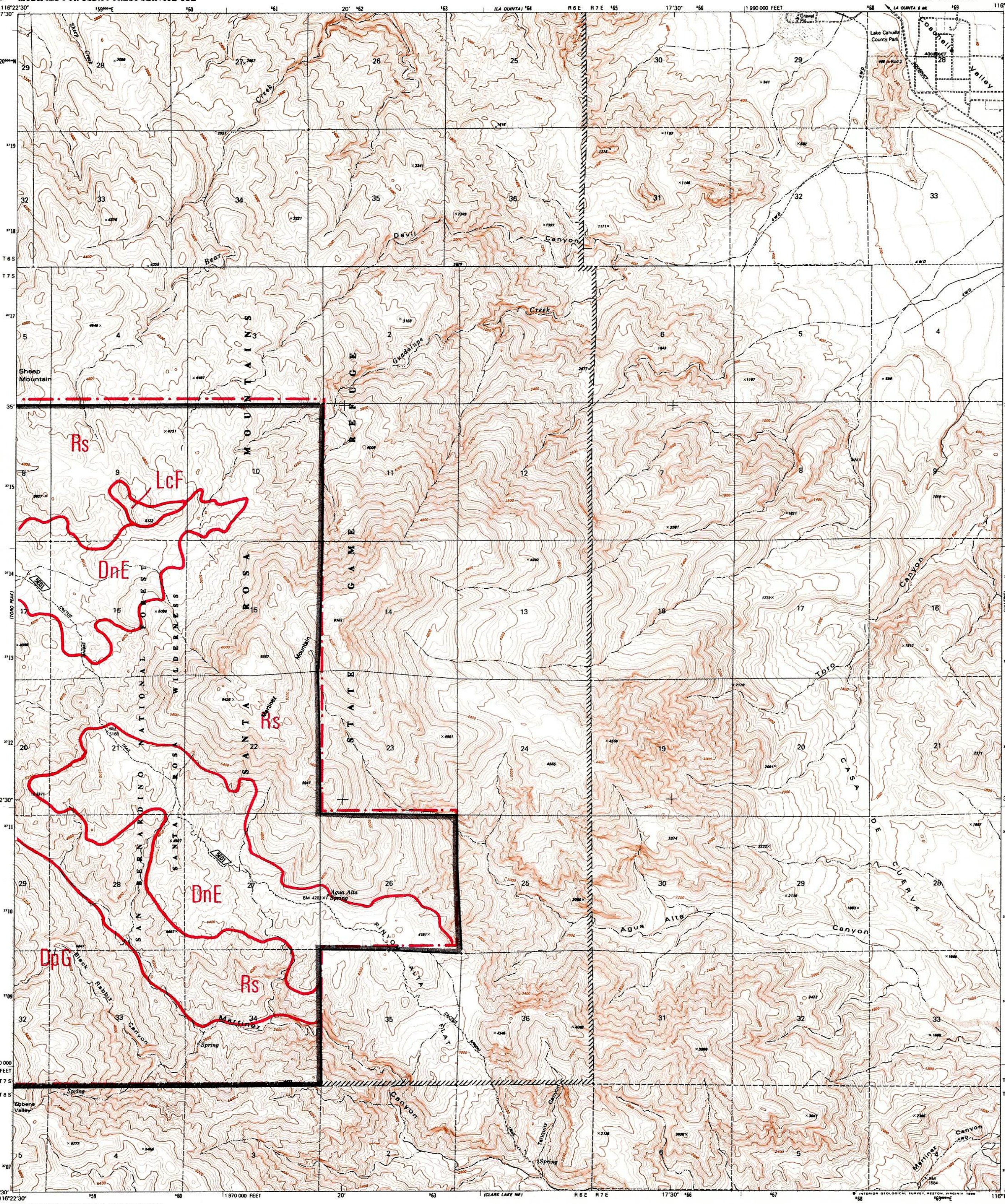
65-3

REVISED 1989

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MODIFIED FOR USDA FOREST SERVICE USE

62

MARTINEZ MTN. QUADRANGLE
CALIFORNIA–RIVERSIDE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 PALM DESERT 15' QUADRANGLE



Base map prepared by the U.S. Geological Survey

Control by USGS and NOS/NOAA

Topography by photogrammetric methods from aerial photographs taken 1975. Field checked 1976
Map edited 1981

Projection and 10,000-foot grid ticks: California coordinate system, zone 6 (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid, zone 11
1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 1 meter south and 79 meters east as shown by dashed corner ticks

Modification to USGS base map by the Geometronics Service Center from 1984 aerial photography and 1987 correction guides furnished by the Pacific Southwest Region

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
SUPPLEMENTARY CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

National Forest Boundary
Alienated Land within the National Forest Boundary

TOWNSHIP AND SECTION LINE CLASSIFICATION
Surveyed, Location Reliable
Surveyed, Location Approximate
Unsurveyed, Protraction

Primary Highway
Secondary Highway
Improved Light Duty
Unimproved Dirt
Trail
Locked Gate
Road, Location Approximate

U.S. Highway
State Highway
County Road
Forest Highway
Forest Road
Forest Trail
Trail, Location Approximate

65-2	65-1	64-2
65-3	65-4	64-3
47-2	47-1	46-2

ADJACENT QUADRANGLE LOCATION DIAGRAM

MARTINEZ MTN., CALIF.
SE/4 PALM DESERT 15' QUADRANGLE
N3330—W11615/7.5

1981
PHOTOREVISED 1988
DMA 2751 III SE—SERIES V895
65-4

REVISED 1989